Nature Magazine

VOLUME 35 NUMBER 3

MARCH 1942

35 CENTS

Why your Red Cross urgently needs

FIFTY MILLION DOLLARS, NOW

How the fund is allocated . . . What it does in service

Every dollar that you give now to your Red Cross marches into the thick of things where humanitarian help is needed most—up to the fronts and battle stations where the fighting is heaviest. Into the Red Cross hospitals and First Aid units where prompt medical attention and supplies may save innumerable lives. And throughout our broad land to train and equip volunteers to meet any emergency that may strike.

How the $50,000,000 War Fund is Used

SERVICE TO THE ARMED FORCES $25,000,000

Provides for the care, welfare and morale of the Army and Navy, including services to men in hospitals and during convalescence. • Provides an important link between the service men and their families; keeps the families from breaking up, supplies food, shelter, medicine, and even jobs where necessary. • Provides essential medical and other supplies outside of standard Government equipment. • Operates Red Cross headquarters at camps and naval stations. • Enrolls blood donors and medical technologists for Army and Navy needs. • Provides millions of surgical dressings, sweaters, socks, etc. through volunteer workers.

DISASTER AND CIVILIAN EMERGENCY RELIEF . $10,000,000

Supplies emergency needs for food, clothing, shelter and medical attention for disaster victims. • Assists stricken families in repair of homes and other adjustments; provides minimum reserves of essential relief supplies to prevent unnecessary delays.

CIVILIAN DEFENSE SERVICES . . . . . $ 5,000,000

Trains volunteers for home nursing and nurses' aides. • Trains nurses, men and women, for active duty with the Army and Navy. • Trains volunteers in First Aid and accident prevention. • Trains volunteers for work in Motor Corps, Canteen and Production. • Instructs men, women and children in preparedness against explosive and incendiary bombs. • Organizes for evacuation of children and their families from stricken areas. • Assists Red Cross Chapters in establishing effective coordination of emergency relief with local and State defense authorities.

SERVICE AND ASSISTANCE THROUGH CHAPTERS $ 4,000,000

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OTHER ACTIVITIES AND CONTINGENCIES . . . $ 6,000,000

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TOTAL $50,000,000

THE AMERICAN RED CROSS $50,000,000 WAR FUND

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Camera Trails

BY NORRIS W. HARKNESS

TULIP TREE IN WINTER. PHOTOGRAPH BY MRS. A. M. VOESKE, BRECKSVILLE, OHIO

Keep It Simple

Nine out of ten amateur pictures have too much in them. It may be background material that attracts too much attention, or some object anywhere in the picture area that competes with the principal subject of interest. It is difficult enough to make a shot that will catch and hold attention, and mean something to its audience, but when we leave competitive objects in the same picture, we have an extra handicap.

In baby pictures we often find toys so prominent and so brightly lighted that we wonder whether the title ought to be "Baby", or "Toys With Little John". Or maybe the shot is made indoors and a doorknob or a wall panel is too obvious, or father's knee occupies as large a part of the print as does baby. In landscapes a telephone pole, or its wires, often spoil what would otherwise be an attractive scene, or a tree juts up in the wrong place. But these background troubles, while they ruin a great many good pictures, are only one angle of this question of stronger pictures.

In an argument we hate to have someone throw us off our course by changing the subject. The new thought interferes with our train of ideas and weakens what we are trying to prove. In pictures exactly the same thing happens when we allow an extraneous element to intrude on our original theme. We are trying to concentrate all the interest on one object, or set of objects, properly arranged, and then we slip in something that says "Look at me, too. I'm here."

By eliminating the unwanted material, we keep out the interfering new thought and let the audience see the picture we had in mind in the first place. This might be said more simply by suggesting that including only the really important objects in the picture makes for a stronger result. Sometimes we cannot get rid of some distractions, but hunting around for the best viewpoint and camera height will usually do the trick. If that fails, we can use a bigger diaphragm opening with its smaller depth of sharp field. We focus on the principal subject, or perhaps even a little in front of it, and open the diaphragm to a big stop. This throws the background more or less out of focus and holds the interest in the front of the shot.

But the easiest way of all is to adopt a closer viewpoint that keeps the unnecessary objects outside the picture area. If it is not in the negative at all, we will have no trouble in getting rid of it. The best pictures show care and thought before the shutter is snapped. It all sums up to keeping the picture simple and to showing only those things that will improve the result. Anything else cannot fail to make the shot less effective.

WINTER BANK. PHOTOGRAPH BY MRS. OTTO IVONEN, CLARKSTON, MICHIGAN

Have You Tried A Series?

In talking a few days ago with an official of one of the larger picture-selling agencies he told me that the most effective—from his standpoint—pictures were the series shots that told a complete story with almost no captions. I mentioned the conversation a day or two later to one of the country's best teachers of photography, and his comment was that series pictures are the best possible way to learn photography.

From time to time I have suggested the making of year-long and day-long series of the same subject. The garden shown through all seasons of the year, or with the sun at all the angles it takes from dawn to dusk in a single day, offers chances to study lighting, variations in composition, and all the other elements that enter into a good photograph that is at the same time a good picture.

Why not start now? Choose some attractive subject that is near the house so that there will not be the temptation to put off making the pictures because of distance. Then select a viewpoint that makes a good composition. For the day series make the first shot as near sunrise as possible, and then make others at regular intervals throughout the day until the last is made almost as the sun disappears below the horizon. Some one of them will be better than the rest, and that will show the time to make all the shots for the year's series—not at that clock hour, of course, but when the sun is at the right height.

The garden, a wheat or corn field, the tree in the yard—almost any subject will serve provided it is a picture subject in itself. But make the best print you can from each negative and then line up the whole series. It will be a good show and you will find that you have learned to make better pictures by carrying out the idea.

Problem Corner

M.L.T., Gloucester, Mass., asks for a data book with formulas and developing times for different films and developers plus filter factors and as much other information as possible.

ANS.—The book you want is the Photo-Lab-Index published by Morgan and Lester, 100 East 42nd Street, New York, at $3.50. The Index is a loose-leaf book that covers practically everything in photography in detail. Supplements are added quarterly to keep it up to date. The latest, the tenth, has a chapter on optics, plus correction sheets, and the latest data on all subjects. Nothing to equal it has been published.

F.O'B., Dallas, Texas, asks: "What can I do to make my glossy prints come off the tins without dull spots and curved wrinkles? Almost every print I make has either or both troubles."

ANS.—First be certain that the tins are perfectly clean. Grease or dirt will show on the print, which can have no better gloss than the tin. Clean the tin with clean warm water and a soft cloth. Then use gasoline or Carbona gently to get rid of any grease, and rinse thoroughly with more warm water. Have the tin flooded with water and put the print on the tin directly from the wash water. Be sure that everything is flooded. Then make the contact certain by rolling the print with a roller, or by thorough use of the squeegee. The prints should come off as

you want them. If they still wrinkle, soak them for five minutes in one ounce of ordinary glycerine in twenty ounces of water after the washing is finished. If you use heat to hasten the drying, apply the heat through the tins and not to the print side.

H.F.S., Americus, Georgia, says: "I underdeveloped a roll of films that I simply must print. The developing time was cut in half and the negatives are too thin to print, but they seem to have enough detail and were properly exposed. What can I do about them?"

ANS.—If the trouble is due to underdevelopment and not to under-exposure, intensification will fix them. Several methods are possible, but the chromium intensifier is probably the best, especially if the negatives are to be enlarged. Others cause more grain. Be sure the negatives are well fixed and thoroughly washed. If they are not, they may stain in the intensifying. Then bleach them in the following solution: Potassium Bichromate—1½ ounces; Hydrochloric Acid C.P.—1 ounce; Water to make 16 ounces.

Be sure to add the acid to the water and not the other way round. This is a stock solution that will keep. Take one ounce of the solution and add ten ounces of water at room temperature. Bleach the negative entirely in this bath and then redevelop it, after a five-minute wash, in D-72 or some other developer that has not a large quantity of sulphite. D-76 will not work well. Fix it for five minutes and then wash well. The process may be repeated if the intensification is not sufficient the first time. If the negatives were under-exposed, intensification will not help them.

This and That

When the first blossoms begin to challenge your camera, remember to use a filter to darken the sky and focus sharply on an overhanging branch. A long sweep of a branch diagonally across the picture area is the conventional plan, but you will discover that the different branches will provide varying compositions. Remember, too, that light-colored blossoms will appear reduced in size if you diffuse the enlarging, but will seem larger if the diffusion is done when making the exposure with the camera. Look out for your meter readings when you aim at the branch. So much sky light will be included that there is danger of bad under-exposure. The normal exposure for the tree when the camera is level will be about right—plus the filter's extra needs, of course.

Eastman Kodak has issued, during the past few months, a series of some nine booklets that retail up to 35c and cover Kodachrome, Infrared, Kodak Films, Slides, Papers, Filters, Formulas, and Copying. No data published is more complete and no publications will be more helpful. In addition to the booklets about a dozen pocket guides have been issued covering exposures under varying conditions with all materials, filters, and other valuable data. They retail for 10c. Your dealer has, or can get, any of these for you, or you might write to Eastman Kodak Company, Rochester, New York, for details. Ask for material on the Data Books and the Guides and mention Camera Trails.

Most highly recommended—*The Photographer's Rule Book* by Larry June (The Macmillan Company, New York, $1.25). The title is a little misleading for this is not a book of dry rules by any means. It suggests innumerable picture subjects and then proceeds to outline at least one possible method of shooting each kind and lists the "don'ts" and troubles that may be encountered. It is short, with only 89 pages, but you will enjoy reading it and will find it the most valuable single volume for the less experienced photographer since Eastman published *How To Make Good Pictures.*

Owners of movie projectors, whether they make their own films or not, should investigate the films offered by Castle Films, 30 Rockefeller Plaza, New York. Castle has a catalog of 8 and 16mm films, with and without sound, covering everything from cartoons in color to the latest newsreels. As this is written the latest film is "Japs Bomb U.S.A.", the events of December 7. By the time this reaches you another almost unbelievably timely film will have been issued, "Britain's Commandos in Action". More of these current history films will be issued from time to time, and the film libraries will simply have to have them. Catalogs may be obtained from Castle Films, 30 Rockefeller Plaza, New York. Please do not forget to mention Camera Trails when you write.

The Weston Electrical Instrument Company has published a new pocket-size booklet of Weston ratings for practically all films at 10 cents. If you want a copy, send a three-cent stamp to Camera Trails. Only a limited number are available, so ask for yours now. We can send only one to each reader.

Photography as a Vocation by Andrew B. Hecht, Editor of Popular Photography, and George J. Berkowitz of the Science Research Associates, will answer all the questions you may have about the possibilities that there may be for you in photography as a means of making a living. It is number 24 in the American Job Series and may be obtained for 50 cents from Science Research Associates, 1700 Prairie Avenue, Chicago, Illinois. Better read it before you think too much about starting a photographic career.

Camera Trails is published for the benefit of Nature photographers and maintains a service to help them solve their photographic problems. The editor will also welcome your comments and suggestions as to what subjects you would like to have covered in these columns. Send your communications to Norris W. Harkness, NATURE MAGAZINE, 1214 Sixteenth Street, N.W., Washington, D.C.

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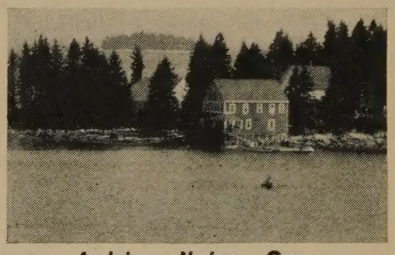

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To Stimulate Public Interest in Every Phase of Nature and the Out-Of-Doors, and Devoted to the Practical Conservation of the Great Natural Resources of America

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Pep Up Your Meetings

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FILMING WILDLIFE REQUIRES TIME, PATIENCE AND ENDURANCE

For forty years William L. Finley has been shooting wildlife. But everything he has shot still lives for it was shot with a motion picture camera. More than two hundred thousand feet of film now carry the record of his camera hunting.

The American Nature Association commissioned Dr. Finley to edit eighteen 400-foot reels of 16 millimeter motion picture film, drawing upon the best of his material. Thus 200,000 feet of 35 millimeter film are condensed into the equivalent of 18,000 feet of the best shots of all.

These interesting, entertaining and educational films are grouped as follows:

GROUP I: Specially adapted for school use and for juvenile audiences.

11. *Babes in the Woods:* The life of Nature's young in the wild.
12. *Wild Animal Pets:* A naturalist's dog into whose life came many strange animals.
13. *Renting Houses for Songs:* An intimate study of bird life.

GROUP II: A spectacular series of Alaskan reels.

21. *Cruising North:* Murres, sea puffins, bear and other coastal wildlife.
22. *Off to Glacier Bay:* Spectacular pictures of the face of a glacier breaking off and plunging into the bay. Also wildlife scenes.
23. *Wild Animal Outposts:* Hardy Island deer, ptarmigan, bear cubs, blue fox, fur seals of the Pribilofs.
24. *Thar She Blows:* Whales at sea.
25. *Great Bear of Alaska:* Films of the great Kodiak bears of Admiralty Island.

GROUP III: Southwestern series.

31. *Wings to the South:* Bird life of the Texas Gulf coast and the southwest.
32. *Riding the Rimrock:* Searching the rough country of the southwest for its wildlife.
33. *Nature's Side Show:* The struggle for existence in the arid southwest.
34. *Queer Creatures of the Cactus Country:* A study in the adaptation of wildlife to a harsh land.
35. *Getting Personal with Mountain Lions:* A thrilling picture of a pack trip into lion country.

GROUP IV: Photographed along the Continental Divide.

41. *The Big Game Parade:* You meet Antelope, Mountain Sheep, Mule Deer, Elk, Bison, Moose, Brown Bears and Grizzlies.
42. *The Forests:* Forest Fires, Birds, Beaver—greatest conservationist of all—at work.
43. *When Mountains Call:* The life of the high places is thrilling to see. Water Ouzel, Ptarmigan, American Eagle, Big Horn Sheep, Wapiti—American cousin of the European Stag.
44. *Ramparts of the North:* Filming big game requires endurance. Glaciers, Hoary Marmot, Caribou, Moose, Black Bear.
45. *Getting Our Goat:* Mountain Goat on its native crags. Ground Squirrels, Cony, Grouse.

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Nature in Print

By HOWARD ZAHNISER

SOMEONE with a sense of humor has recently put into circulation a definition of an optimist as one who believes that the future is uncertain. Willy Ley and Jay Franklin, however, from cosmic and national points of view, respectively, have recently written volumes with assurances for a future of human certainties.*

Says Mr. Ley, after describing what he calls *The Days of Creation,* "The record of the past is, on the whole, most decidedly in favor of continued survival of the human race under any circumstances," and he concludes his book with the thought that even in case of a cosmic upheaval "man is incapable of doing anything but carrying on."

Says Jay Franklin, protagonist of the New Deal, in *Remaking America,* "We face the future, without illusion, but also without fear, for the future will be as we make it and we have found the will and the power to make the future ours. The American dream is over, but the American reality is greater than all the things men dreamed about it."

A journalist of science and a journalist of politics thus give a hopeful slant to their news of the day.

It seems significant that both these conclusions are based on an understanding of man's relationship to what we call Nature. This is, of course, true of Willy Ley's biography of the earth. The same eloquence that made *The Lungfish and The Unicorn* such a welcome collection of wildlife myth, legend, and lore makes *The Days of Creation* another welcome popularization of the conclusions of science regarding the origins and history of life. By placing his account, chapter by chapter, alongside that of *Genesis,* Mr. Ley achieves an added literary charm, although the parallels are rather suggested than revealed, poetic rather than scientific or theological. The book has also the advantage of a well-handled narrative. Yet, with all these graces of good authorship, *The Days of Creation* has interest mainly because its prospective readers are concerned with knowing just what their place is in the whole scheme of Nature.

It is, however, no matter of course that Jay Franklin, the exponent of a political philosophy, should devote the first half of *Remaking America* to "The Forests," "The Grass," "Wild Life," "The Soil," "The Rivers," "Little Waters," and other considerations relating to "The Land" and "The Water." It is rather a noteworthy reason for encouragement among all those who call themselves conservationists to realize that a fundamental concern of those who have been remaking the country is the establishment of prudent attitudes toward our natural resources. Those who were advocates of conservation during the formative years of the New Deal will be especially encouraged by Jay Franklin's retrospection, for they will find rather impressive the accomplishments along lines of activity that only a few years ago were for the most part hoped-for sidelines to the social-economic programs of the Federal Government, sidelines now seen as fundamentals in a new economic and social order.

Remaking America is not, however, precisely speaking a volume on conservation. The climax of the book is in the final part devoted to "Freedom," which is reached after a part that discusses "The People." This makes all the more significant Mr. Franklin's 139 pages that report the state of the nation with reference to undoing the exploitations of three centuries and wisely handling problems relating to the land, the waters, the wildlife, and other resources. These pages are in themselves valuable. Some errors of fact or interpretation that are characteristic of the journalist's assembling of material on such a variety of subjects with which he can not hope to be intimately familiar are apparently inevitable. In those paragraphs dealing with subjects with which I am familiar I note, for example, that the Migratory Bird Treaty is dated 1913 instead of 1916, the national wildlife refuges are 275 instead of 267, the National Zoological Park in Washington becomes a "geographical" park, and a questionable interpretation is made to the effect that "it was not so much the wanton slaughter of the buffalo by hunters which destroyed the great herds which ranged the Great Plains as it was the railway lines, the barbed-wire fences, and the plowing-up of the prairies." Such accidents of journalism, however, as can be seen from the character of these examples, can not be seriously detrimental to the value of *Remaking America,* which seems to me to be essentially an over-all story of what we Americans are doing with our heritage, and incidentally one of special interest to those who have seen national well being from an outdoors point of view.

Mr. Franklin's volume is more than a sketch of a past decade, for its climax is related to the future. "Fortunately, for the American people," says the author, "eight years of domestic reform had partially equipped them with the indispensable means of resisting a war," and he makes it plain that this national conditioning for our present emergency has involved those influences that conservationists have cherished for their contributions to national as well as individual morale. In fact, he emphasizes the importance of avenues "into the realm of the spirit" and includes the worship of beauty and respect for life, along with the sense of freedom and search for God, as needs in a pursuit of happiness that is essential to our best-laid national plans.

Remaking America is a most timely inspiration to patriotism, for it emphasizes the factors that are essential to a zealous defense. (Continued on page 162)

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*Recently published books discussed in this article are:

The Days of Creation. By Willy Ley. New York: Modern Age Books. 1942. 275 pp., with index, table of geological periods, and more than 50 drawings, including 7 chapter headings by Gustav Wolf. $2.75.

Remaking America. By Jay Franklin. Boston: Houghton Mifflin Company. 1942. 287 pp., with 35 photographs and endpaper colored sketch map of the United States. $3.

ZULU GRASPS A GRASSHOPPER, WHICH HE REGARDS AS A PARTICULAR DELICACY. IN THIS PICTURE OF THE LITTLE MARMOSET, MADE BY HIS MASTER, ZULU IS SHOWN AT FOUR-FIFTHS LIFE SIZE.

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Many are the happy experiences to be enjoyed from—

LIVING WITH A MARMOSET

Photographs by Richard L. Aeck

By SARA MENABONI

It is difficult to think of Zulu as a mere pet. So varied is his personality and so unusual his response to the life that he has shared with us for eight years, that his status is not easy to define. While we were learning about marmosets from him, he taught us many things.

As I write, Zulu is on my lap, gently yet insistently gnawing at my elbow. On his face is a hopeful expression that begs me to play with him, or, at least, stroke his silky fur. With one finger I tousle his fur, but he clasps my finger in his two hands and, kitten-like, chews upon it.

He is no bigger than a minute. I can cover him with my hand, except for his nine-inch tail. His waist is only the circumference of a half dollar. His fine teeth would cause no more damage than a pin prick were he purposely to bite. He has a walnut-sized head, which contains a brain that continually amazes me.

Zulu's long white ear-tufts add the finishing touch to his odd little face. He likes to have them pulled. He has a stubby white beard and mustache; warm gray fur on the rest of his head, except for the spot of white on his forehead above his flat nose. Around his amber-colored eyes, and over the lower part of his face, the skin is yellowish, yet his nose and its immediate vicinity is brown. So his face pattern is a bizarre one.

Zulu enjoys having his body fur ruffled "against the grain." His general appearance is mottled, but parting his fur shows distinct colors. First is the white of his skin, then black, ochre, brownish-black and gray. The hairy tail lacks the ochre color, being alternately banded with black and gray. It is not a prehensile tail, yet it has other than solely ornamental uses. To me the faint, sweet odor of the marmoset is pleasant.

As he climbs up my sweater, the claws on his hands are helpful. The great toes on his feet have nails. Despite his midget size, there is great strength in the hands. When he climbs on slick surfaces he grips with his palms. Descent may be head-first or tail-first, according to his mood.

Failing to command my entire attention, Zulu jumps confidently to the top of the typewriter ribbon roll and sits there watching. He decides to try the keys himself, but as he walks delicately, his weight is not sufficient to press the keys all the way down. He can see his reflection, in the shiny surfaces of the typewriter, a phenomenon that always pleases him. Finally, bored, he spies sunshine on the sofa and leaps away from me, his tail acting as

ZULU PREPARES TO LEAP
His intention is indicated by the bristling of his tail, a sign of nervousness before taking off for some new perch and another adventure

a rudder in a series of jumps that resemble a flight.

Stretching luxuriantly, Zulu takes a sun bath. His lower lip droops in a smile of satisfaction. He utters a barely audible song of contentment.

How different it was eight years ago when Zulu entered our lives! Freed in our house, he defied us. Belligerently he swayed from side to side, his fur bristling. His piercing cry was deafening. Arrogant and with fighting spirit, he pitted his strong will against ours. He was a tiny version of pictures of bedecked Zululand warriors. So we named him Zulu.

He was a holy terror, a challenge to Athos and a perplexity to me. I could not then picture the ferocious mite as a household pet. But my pleased husband assured me that sympathetic understanding, kindness, and a little discipline would accomplish wonders. From the beginning—books giving us no advice—we used the trial and error method in rearing him.

I tried to understand his dilemma. He was scared; confronted with strange people; abandoned by his former owner; alert to any possible dangers lurking around him. It was a tremendous problem for so small a brain. He must, I reasoned, become accustomed to us and find that he was not to be bodily harmed. So, for a time, we appeared to ignore him entirely.

MARMOSET BREAKFAST TIME

Two spoonfuls of milk will last him until lunch. The size of Zulu in relation to his spoon gives a graphic idea of his diminutive stature

Zulu began exploring the house. He ran up curtains with effortless agility. He managed the smooth surfaces of the furniture and doors. He found ingenious ways to go from room to room without touching the floor. Food and water were always in the same place, and he could rely on a variety of foods from which to choose. Gradually he began to accept us as movable fixtures in the house, and a source of no disturbance to him. Yet he remained nervously alert, and when he took sun baths on the window sills he sat in a tense, tight ball.

Approaching Zulu, we avoided quick, startling movements; offered him irresistible tidbits. He began to realize that the hands were kind. The next step in winning his favor was to stroke his fur. Once this was achieved all barriers were dropped; Zulu accepted us as friends.

For the first months of training, a shortened wristwatch strap was put around his waist and a leash attached. Thus it was easy to teach him the parts of his daily life that were routine, exciting or playtime. His keen mind quickly learned our way of living and what we wished of him. He learned something of discipline, but it was never such as to break his spirit or destroy his individuality.

Often we took off the leash to allow him hours of complete freedom, yet more often than not he preferred to stay on a shoulder. Whenever the leash was to be put on, we showed it to him and patiently waited until he submitted willingly. Appearance of our hats and coats sends Zulu scurrying to have his leash attached. He hates to remain at home alone, and his cry, which sounds like a bird call, may be heard for blocks.

Such a tiny, sensitive creature one cannot whip in discipline. Speaking crossly and firmly will check any mischief—until our heads are turned. Zulu is stubborn. It was impossible to house-break him, yet his habits are not particularly objectionable, in view of his size and the convenience of absorbent tissues.

After one experience we never raise our voices loudly to him. Zulu likes to examine the leaves of the potted plants, searching for insects. Once he broke the stem of a prized plant. Athos shouted at him. Zulu, frightened out of his wits, ran screaming behind a radiator. It was not until the end of the day that I could coax him from his hiding place by the bribery of candy. He emerged only after he had carefully smelled my hand to determine if anger was in me. Not for a week would he allow that man near him. The strained relations were overcome with the aid of tempting food. Again and again Zulu sniffed Athos' hands. To us this was proof that he could detect a person's humor by bodily odors.

Zulu knows the meaning of "No" in any tone of voice. By our inflections he understands what is permissible. He knows his name when called, but he responds according to his mood. Sometimes he seems to say, although in terse silence, "I can't be bothered." Yet the words "tea time!" bring him in a rush from wherever he may be.

A moment ago I heard Athos call to Zulu before going out. At such an invitation he dashes straight to Athos, holds to his shirt collar, and rides forth. Yet, strangely, he is afraid to be left alone even a few minutes in the open. Perhaps there is not enough protective thick foliage, or else we have completely changed his desire for his native arboreal habitat.

Zulu has regular hours for eating, and the table manners that he learned that first month while wearing the leash have become a fixed habit. While perched on a

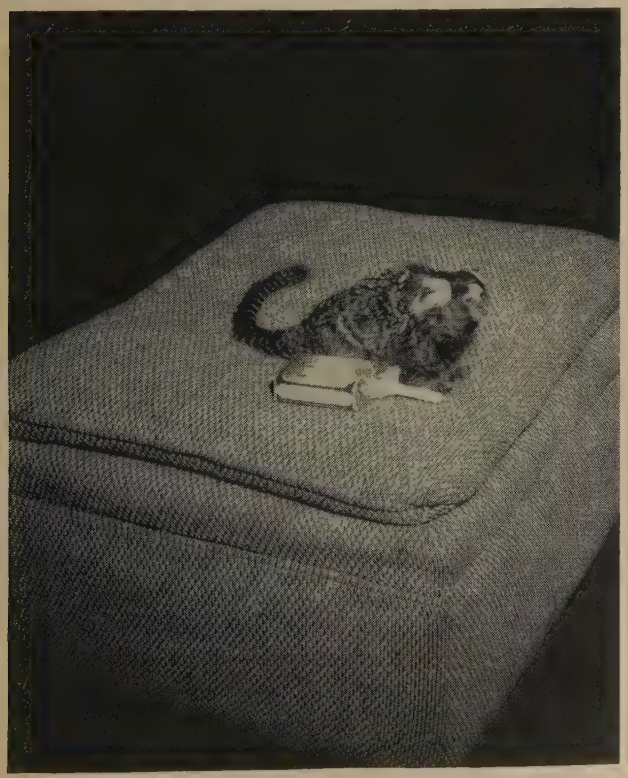
INVESTIGATING POSSIBILITIES

Zulu peers curiously into a cup to discover whether it holds anything of interest. His size and activity make him a most difficult photographic subject

shoulder, food would be offered to him in a spoon, for he was not allowed on the table. Later we spoiled him by letting him sit sometimes on the corner of the table. Still, he must politely wait beside his spoon until food is given to him. He can have anything to eat that we have, excepting too many sweets, which are his weakness. Zulu knows the meaning of "wait" when hot food is given him, and, to pretend that he is not over-anxious, he will turn his head away. After he thinks it is cool, or we tell him that he can go ahead, he will cautiously taste it at the edge. One day he prefers a certain thing; the next he will not touch it. Very ripe banana is his chief food. It is almost incredible that such small quantities of food are sufficient for a body and mind so constantly active. Two spoonfuls of milk in the morning suffice until lunch.

Certain delicacies definitely thrill Zulu. Literally with watering mouth, he is nearly hysterical until we pour his portion of his favorite cola drink. He dances about until the gas has escaped, for he knows it will get in his nose and make him sneeze. The mucilage bottle puts him into a frenzy. He will lick up its contents as fast as it is spread. A postage stamp cannot be left around, or it will soon be glueless. For Christmas he received an envelope addressed to "Zulu Menaboni" containing a year's supply of Christmas seals.

A satchel is Zulu's bed. Thus he may be taken about and yet feel the security of his habitual sleeping place. Inside we placed a yellow cotton blanket. When it was removed to be laundered we had a frantic pet until it was replaced. As hot weather came, the satchel was too stuffy, and Zulu searched for another sleeping place. Athos put



a basket near the ceiling of the screened porch, and Zulu instantly knew that it was intended for his summer bed. He seemed to like it, yet he was restless and could not settle down for the night until his blanket was placed in the basket.

Affection is strong in our little marmoset. After he has gone to bed and sung his lullaby—an even-song of soft, lisping cheeps—I feel under his blanket. He holds one of my fingers, kisses it, and is reluctant to turn it loose. "Sing your song, Zulu," I suggest, and unfailingly he will repeat it to please me. Frequently, driven by an emotional impulse, Zulu will rush from another room just to kiss our hands. He likes to snuggle on our necks, and if he feels particularly ardent he will carefully search through our hair, looking for—heaven knows what!

Grasshoppers are his choice of insects. After one is given to him he holds it tightly clasped in his fist. For a long moment he has an expression of genuine gratitude as he looks directly at the donor.

If we leave him alone at home, it is evident on our return that his feelings are deeply hurt by our desertion. Yet he feigns indifference. He has a poker face, and he turns his head away to ignore us as though we were nothing in his life. We walk around to face him, but he refuses to give us the satisfaction of looking at us. We must excite his curiosity, bribe him with a small piece of chewing gum, or tousle his fur, to be forgiven.

Zulu has never been ill, suffering only car and train sickness. This he overcomes quickly as we pet him continuously, helping him to realize that there is no cause to be nervous about the trip. In turn, when Athos had influenza, Zulu's sympathy was touching. He did not leave

HE IS AN ANTI-CIGARETER

He finds particular pleasure in pulling the cigarets from the package, one by one, and then tearing them up. He appears gleefully about to go to work

the side of his master, except to eat and go to his own bed at night. Summer heat is a discomfort to Zulu and Athos was feverish, yet Zulu insisted upon staying close to the man who, he felt, needed his affectionate companionship at that time.

We put him to a test to see his ability at climbing and gripping. Athos stood on a bluff, holding a bamboo pole and fishing line, while I was some ten or fifteen feet below, with Zulu on my shoulder. When Athos called his name, Zulu immediately caught the dangling fish line, scampered up it, and ran along the pole to the arm of his master.

ANOTHER BIT OF BREAKFAST

The marmoset's varied color, white ear tufts and tiny face make him rather indistinct in a picture

As he has grown older, whether out of jealousy or other motive, Zulu resents an overnight guest. In the morning, if he finds someone has stayed over, he fiercely tries to attack the person with whom he was friendly the night before. On such occasions he must be shut in another room and is miserable for the duration of the visit. He is so glad when the visitor has left that he sings for hours afterwards.

Zulu likes for a room to be swept, for he plays "hide and seek" with the broom, dodging, dashing away, hiding, leaping to catch the broom, running behind furniture. Often when we enter a room where he is, Zulu will hide quickly from us, and if we discover him he seems to say "Aw, shucks!"

One day some grasshoppers were presented to him in a safety match box. He could hear them thumping; perhaps he smelled them. He examined the box minutely, turned it over and over, as he tried to find the opening. After a few minutes of experimenting, Zulu found out how to slide the box open. Another time, when several grasshoppers were in a glass jar, he reached down inside but could not catch one. It was tantalizing to have success just out of his grasp. He frowned. His expression changed as he obviously arrived at a conclusion, for he stopped trying to reach inside the jar: he sat still, observantly waiting until the grasshoppers, seeking release, came to the opening and were nabbed.

The first time that Athos caught a wasp he kept telling Zulu to "wait" until the sting had been extracted with tweezers. Impatient, Zulu impulsively grabbed the insect. He paid the penalty for disobedience, for the wasp jabbed the sting into his palm. For relief he violently beat his hand on the floor. Strangely, the hand did not swell, nor did the poison make Zulu sick. After a few minutes of sympathy, he seemed to forget the occurrence. But the next time that Athos caught a wasp for him, without being told Zulu waited until the sting was extracted and the wasp was proffered to him.

We showed him a life-sized book illustration of a grasshopper, and he leaped to grab it, looking very surprised to find empty hands afterwards. He had an intelligence superior to that of a dog or cat to recognize a photograph, and we were anxious to know if he would fall for the same trick on the following day. When we showed him the printed page, he would not be duped the second time.

Zulu must have been about two years old when he came to us and he has been with us eight years, so he is at least ten years old. What this means in terms of marmoset age, what is his life expectancy, we do not know. We are not too anxious to find out. There are evidences of changes of disposition, he is no longer so playful as he was, but is more inclined to sit thoughtfully apart. His curiosity is as lively as ever, but he is less amiable to visitors than he was in his youth.

It is not so easy to see change in our pet because by this time his adaptation to his environment is complete. We have refrained from subjecting him to changes of any sort. We are making no experiments of which he is the victim. We have allowed him to settle into a peaceful routine of life in which he can scarcely be expected to show whether he is growing old, or merely growing older.

•

Sunrise

By HARLEY FETZER

In summer when the sun's first beam
Has introduced the day,
And light bursts forth, a golden stream,
To set the countryside agleam—
Night, awakened from her dream,
Slinks furtively away.

Soon diamond dewdrops glitter bright
On clover scented hay,
While birds on wing in early flight
Greet with song the morning light,
And the sun's increasing height
Proclaims another day.

Following the nectar from state to state go—

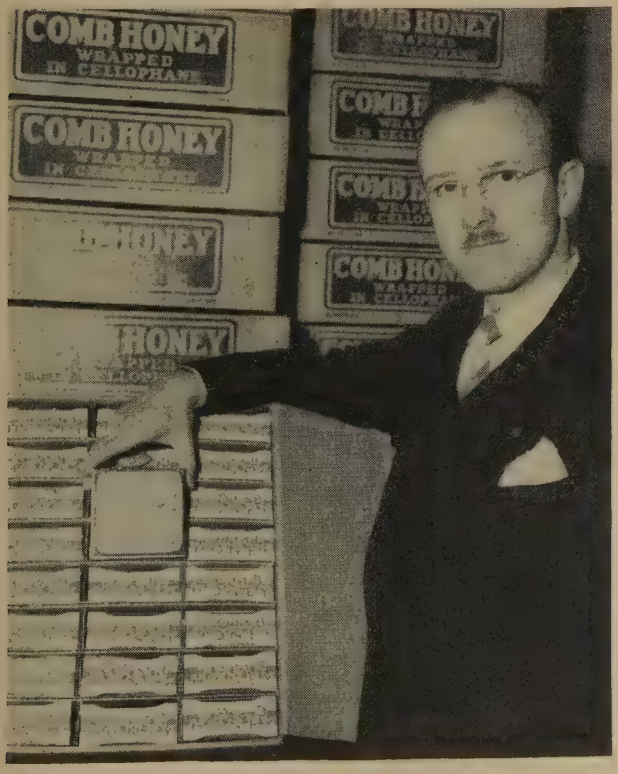
Woodrow Miller's Traveling Bees

By FRANK J. TAYLOR

THE WORLD'S champion bee keeper is Woodrow Miller, a slight, soft-spoken, scholarly-appearing citizen of Colton, California. In 1941, by loading his colonies on trucks like a traveling circus, and migrating from the Mexican border to the Canadian as the advancing season brought the flowers into bloom, Miller gleaned 1,000,000 pounds of honey and 50,000 pounds of wax. The hives that stored orange blossom honey from Southern California in January worked the clover fields of the northern prairie states in September. But not the same bees; bees gather nectar so frantically that they literally wear their wings to tatters in six weeks. Hence, new generations born enroute had to replace the veterans.

Miller has a fleet of specially-designed motortrucks, each carrying 400 hives of bees. The migratory apiaries pause at small plots of otherwise useless land in six western states that the bee man owns or leases.

Woodrow, Ray, Earl, and Dell Miller, among them, control about 26,000 colonies. This fabulous armada of insect workers grew from seven hives of bees that Nephi Miller, their Mormon father, got in a swap for a few sacks of oats. That was in 1894, in Providence, Utah. After that, the young Mormon never passed up an opportunity to hive a wild swarm of bees, or to buy another colony at a bargain. He divided his colonies yearly and increased his bees prodigiously.



WOODROW MILLER, MIGRATORY BEE-KEEPER

Both the bees and Mr. Miller are migratory—the bees to places where blossoms are available and their keeper to hunt out the proper spots for the bees

WINTERING BEES IN SOUTHERN CALIFORNIA

William Yack, one of the workers in the apiary, displays a frame of bees from one of the many thousand colonies that continue to produce honey and beeswax

In mid-winter of 1907, while his own bees were hibernating in Utah, Nephi Miller visited Southern California, where he found the bees busily gathering nectar from the orange groves and the sage-covered hills. Miller bought an apiary. That spring he rode back to Utah in a boxcar with 390 hives of bees, a nightmare of a trip. When the train stopped on burning desert sidings, the wax in the combs melted. Train crews, afraid of the bees, refused to help him. The $440 freight bill was more, almost, than the bees were worth in the sorry condition in which they arrived. Once in Miller's Utah apiaries, however, they gleaned a bumper second harvest of honey.

A streak of Mormon stubbornness kept Miller working on the migratory bee-keeping idea. Every winter he shipped bees to California while his Utah neighbors' bees hibernated. Late each spring he shipped them back again, double in numbers. He rode with his bees in antiquated boxcars in which he chopped holes for ventilation, in cattle cars, and on flat cars, experimenting with schemes for keeping the fretful hives cool in transit across the desert and during anxious delays on railroad sidings. Finally, in 1919, Nephi Miller turned to motor trucks.

By this means he was able to have bees that gathered honey one day from Southern California sage contentedly

working the Utah alfalfa the next. After several weeks there, they moved on to Nebraska, Iowa, eventually Minnesota. The Millers acquired hundreds of bee range rights in half a dozen states; the business grew fabulously. One by one the older sons established their own apiaries with bees from Nephi Miller's stock.

After Nephi Miller's death in 1938, it remained for Woodrow, the youngest of the clan, to carry on the main business. He kept 10,000 hives on a mobile basis, turned the other 10,000 colonies over to veteran bee men on shares. Woodrow Miller is the honey marketer for the whole group and by far the largest honey producer in the world. Most of the honey is shipped for use in baking, candy, and chocolate making, for use in marmalades, pharmaceuticals, fountain syrups, and in tobacco curing. In a single deal recently, Miller shipped twenty carloads to market, literally a trainload of honey, gathered by winged workers who rarely glean more than a quarter teaspoonful in an entire lifetime.

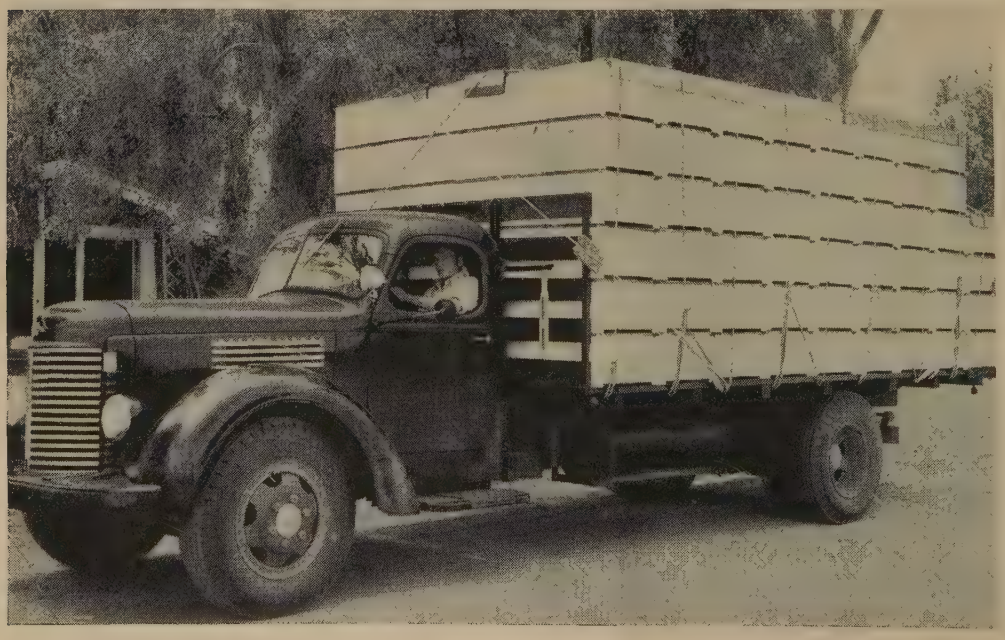
Beeswax, a by-product that this country normally imported in large quantities, ordinarily goes largely into candles or cosmetics. Now the Navy needs it for waterproof coatings for big shells, guns, and aircraft. Normally, bees produce only one pound of wax to sixty of honey. Wax making is the drudgery work in the beehive. Young bees, too immature to fly, gorge themselves on honey, then hang inactive in chains, while special glands in their abdomens make liquid wax. By this tedious labor they convert from each twelve to fifteen pounds of honey they consume into one pound of wax. Prior to the war, most bee men, to save bee-hours for nectar gathering, conserved as much wax as possible in the hives by whirling the honey out of the frames in centrifugal separaters, which left the combs undamaged for return to the hives.

Since Nephi Miller pioneered the technique, migratory bee husbandry has blossomed into a full-fledged industry. Migratory bee-keeping, Woodrow Miller points out, is based on fundamental honeybee habits. If the nectar is there, the bees will find it. Bees have been known to fly as far as ten miles for nectar, but five miles is usually their limit. If they fly more than two miles, Miller contends they are wasting time and wings. So the migratory bee man plants his hives in the middle of a blossoming alfalfa, clover, orange, or sage belt. Miller tries to place the hives so that the bees, when loaded with honey and pollen, will have a downhill glide with their cargo. Thus the bees' wings last from six to eight days longer, and the bee man gets that much more work out of them. When they get too old to earn their keep they are literally taken for a ride by the vigorous young bees and dropped too far from the hive to fly or walk back.

Normally, when the big honey flow ends, the colony curtails its numbers sharply to conserve food. The queen, who may be laying 1500 eggs a day, tapers off to a hundred or so, and finally ceases for the season. As the older workers die or are driven out, the colony strength drops from 80,000 to 10,000 or less.

The Millers' technique in tricking the bees into continuing their increase is, before the peak of the nectar flow passes, to remove half of the frames of bees, eggs, embryos, and honey to a new hive to start a new colony. The extra space in both hives is then filled with empty frames, a wax foundation upon which the bees build new combs. This practice heads off swarming, too, because bees swarm only when they are so numerous they crowd their hives. When this occurs, the older bees gorge themselves with honey and follow the old queen in a swirling, noisy flight across the fields in search of a new hive or a hollow tree, leaving the old home to the younger generation and a newly-reared queen.

When the bee man divides a colony artificially, a new queen has to be supplied to mother the new nucleus. Every year, Woodrow Miller raises 10,000 queens. Several artificially-made wax queen cells, about the size of thimbles, are attached to a single frame of bees whose queen has been removed. Instinctively, the bees place eggs or newly-hatched larvae in the queen cells and feed the embryos on "royal jelly," a milky white secretion from glands in the



APIARIES TRAVEL BY A TRUCK FLEET

One of the many large trucks used by Woodrow Miller to transport his bees from the Midwest to California and back. On this truck 324 colonies of bees may travel in safety to fresh fields

WOODROW MILLER WORKS BY MAP

Here he plots the travels of his bees to a site in North Dakota where the clover or the alfalfa fields are ready to surrender the nectar that goes into the delectable clover honey of commercial use

mouths of the workers, instead of the customary "bee-bread," in a mixture of pollen and honey that is fed to future workers. In sixteen days, instead of the twenty-one days required for smaller worker bees, the young queens emerge.

The queen-raiser gently cages the new queens in tiny wooden boxes screened on one side. This he does promptly, because the first queen to appear will sting to death all the others as they emerge. To install the queen in the new nucleus, the bee man hangs this cage in the queenless hive. She is released only when the bees gnaw their way through a barrier of soft sugar candy blocking her exit from the tiny prison. This two or three-day delay of the queen's release saves her life; it allows time for her odor and that of the colony she is to mother to blend—for bees recognize legitimate members of their own colony solely by the distinctive colony odor and kill all whose odor is foreign. Once accepted, the queen soon embarks on her nuptial flight, mating in mid-air with the strongest-flying drone in the group that follows her. It is a suicide marriage for him, because the drone invariably dies in a few minutes, as his widow returns to the hive to begin her egg laying, her sole function in life. Although she never mates again during her lifetime, the queen is normally fertile for three or four years.

After the new, half-filled hives are placed in the alfalfa fields of Utah in early summer, the bees surge forth in an amazing re-birth of the colony. This is repeated in Nebraska, Iowa, or Minnesota, before the last nectar flow in the sweet clover fields ends in September. The hives are brought to Delta, Utah, to hibernate, not for the six months that a colony normally rests, but only until the first of January. After the brief dormant period, an essential in the colony cycle, the bees begin their winter trip back to the California apiary and the migratory hunt for honey starts all over again.

Before each move, the apiary foreman and his helpers collect the surplus honey, stored in the upper stories of the hives. This is removed by a portable extractor and the empty frames are put back on the hive for refilling. In a good year, a well-managed colony of migratory bees yields the bee man 250 pounds of honey—five times the average for stationary colonies.

The Miller feat of consistently gleaning prodigious harvests of honey is due in no small part to a family instinct for prophesying the weather. The best nectar-yielding flowers burst into blossom in warm spells following generous rains. The bees work efficiently only on warm sunny days. Nephi Miller used to do this crucial prognosticating; now Woodrow Miller does it, studying weather forecasts anxiously and flying from range to range by plane to check the forthcoming blossom outlook before his bees arrive.

Since Nephi Miller first evolved the technique of migratory bee-keeping, other bee men have found various ways to avoid the labor and hazards of wintering bees over in cold climates. Bees normally establish their own community heating systems by balling themselves around the queen and the youngest bees to keep them warm during cold spells. Apiarists usually store hives in bee cellars, or insulate the hives in winter. Even so, a goodly share of over-wintered colonies fail to make a new start the following spring.

In recent years many northern bee men have abandoned the practice of wintering over their colonies. At the end of the honey harvest the bees (Continued on page 164)

TOADS OF ANTIQUITY

Left and right are Chinese devices, above, a Peruvian

It may be a small puddle but the people of Waycross, Georgia, know how to—

Protect the Toad

By LILLIYAN STEWART

WAYCROSS, GEORGIA, is toad conscious. A neglected and often despised creature, *Bufo* is an especial concern of some four thousand school children, and most of the adults, of this southern city. He has come into his own—a big toad in a small puddle.

Every spring "Protect the Toad Week" is observed, but solicitude for this humble fellow extends throughout the year. It is, of course, based upon recognition of the toad's important service to man as a voracious eater of insects, plus, perhaps, a natural sympathy for the under dog. Or, should we say, under toad?

Bufo's own week is set aside to dramatize his social graces. It serves to concentrate attention of the public. And the seeds thus sown prosper and grow through the year. One of the activities of the spring week is to see that toads are made to feel at home. Civilization has complicated life for them. They are not traffic-wise, and broad, level places like streets attract them. So do the insects that street lights lure. So the death toll from automobiles is large.

To offset this Waycross school children campaign to provide attractive living conditions away from hazardous places. Toad houses are placed in yards, gardens, city parks, cemeteries, church and school yards, and on golf courses. These are usually clay flower pots turned upside down. They are buried an inch or two in the ground, a doorway is broken from the side of the pot and this dwelling is placed in some dark, damp, out-of-the-way place, preferably under evergreen shrubbery. Clay is ideal because it retains dampness longer; tin cans are not good. Sometimes the houses are quite fanciful and are properly inscribed as toad residences.

Another necessity, if toad guests are to remain, is water. A small pool in garden, yard, or elsewhere is vital, otherwise the toads will seek the nearest shallow water. Many golf courses have water hazards, which may not delight the players but are appreciated by the toad tribe. Dr. Raymond L. Ditmars of the New York Zoological Society suggested to the Waycrossers that they foster a campaign for the flooding of low parts of the golf courses during toad breeding time. These will dry up in a couple of weeks, he pointed out, leaving an army of young toads who will pay fully for this attention by gobbling up the mole crickets, outstanding golf course pests.

While the common gar-

WAYCROSSERS ADVERTISE THE WEEK

A few of the many friends of the toad in this Georgia city display one of their posters inviting all to join in protecting this friend

den toad provided the first inspiration of this movement, interest quickly spread to include all members of the genus *Bufo*. Published material, popular and scientific, has been gathered and filed in a growing library. Study of the place of the toad in medicine and pharmacy has been one specialized result of the program.

The children have gone deeply into the place of the toad in history and literature. They found that it had suffered severely from advancing civilization; that it has been vilified by every race save the yellow. A possible explanation of this exception was discovered in the fact that the Chinese toad-saint, Gama-Sennin, was also adopted in Japan. H. Murayama, long artist for the *National Geographic Magazine*, wrote the Waycross children:

"In China there is the old legend of Gama-Sennin, who was the disciple of a sage named Roshi. The story is that Gama-Sennin covered his head with the skin of a toad and went about doing good deeds. This tale is thought to have been brought to Japan during the 13th and 14th centuries. During the Tokugawa Period of Japanese history there was an institution known as the Kanu school of art. The many famous artists of this school often depicted the story of Gama-Sennin in their works. No doubt the story of Gama-Sennin had much to do with the respectful treatment of the toad in the Orient."

HOSPITALITY TO THE TOAD

Many are the inverted flowerpots, into which an inviting door is cut, that invite toad tenants

The children learned that the toad is often pictured humorously in Japanese art. One of the most treasured items in their collection is a water color of a smiling toad by a Japanese artist. This was given to them by Dr. Thomas Barbour, Director of the Museum of Comparative Zoology of Harvard University. Framed in teakwood and quartz glass, it is kept in turn by each of the fourteen Waycross schools for a few weeks.

Works of literature have been completely read for toad references. Twenty-six references to toads were found in the plays of Shakespeare. An expert at the Folger Shakespeare Library in Washington, D. C., added one to this list. Last summer the children completed their work on Burns, Whitman, Longfellow, Emerson, Chaucer, Lanier, Poe, Balzac and Hugo. They found only one kindly reference to the toad—Victor Hugo's heart-rending poem, "Le Crapaud."

Toads are not mentioned in the Bible, but "frog" occurs frequently and may have meant toads as well as frogs. Dr. Henry J. Cadbury, professor of divinity at Harvard University, Father Flanagan of Boys Town, and Dr. Howard A. Kelly, renowned surgeon, naturalist and religious educator of Baltimore, assisted in toad researches in religion, and interesting data have been gathered.

Many scientists have helped us, including Drs. Frederick S. Webster, Herbert F. Osborne, G. W. Carver, Doris M. Cochran, H. F. Crampton, E. G. Conklin, O. W. Barrett, Thomas Barbour, F. C. Baker and H. D. House. Dr. Cochran of the U. S. National Museum is directing the plans of our toad museum.

Toad poems and stories for children are collected, and one by Booth Tarkington is especially prized. Jim Tully contributed a beautiful one, as yet unpublished, of the tragedy of the toad. Toad references are sought in mystery and ghost stories; in names of rivers and towns; in astronomy.

The toad has been sadly neglected in the world of music. Geraldine Farrar, music counsel of the National Broadcasting Company, Carrie Jacobs Bond and Amos Berg have devoted a great deal of time and energy in helping us with this phase of toad interest. Bob Burns has promised to sing a toad folk song during Protect the Toad Week this year.

The message and lessons of our toad conservation program have been spread by the press. William Ferguson recently mentioned our toad week in his feature, "This Curious World." George Matthew Adams devoted one of his columns to our toad efforts, and gave us a first edition of A. A. Milne's play, "Toad of Toad Hall." Alice Hughes, *New York Post* columnist, Sara Wilson, *Baltimore Sun* columnist, and Princess Alexandra Kropotkin, of *Liberty Magazine*, have publicized toad protection throughout the country. Robert Ripley has given us all of his toad Believe-It-Or-Nots.

All information, literature, publicity, pictures, cartoons and the like have been voluntary contributions. We have never asked or received funds from anyone or any organization. The interest in toad work is cumulative. One friend of our movement tells another and thus our work has progressed until 142 leaders in various fields of endeavor are active.

The children keep scrapbooks of pictures of toads cut from magazines and newspapers. The Theodore Presser Music Publishing Company has given us Conrad Dickel's painting of toads that appeared on the August, 1932, cover of *Etude*.

Walt Disney drew a cartoon for us about Donald Duck being kind to a toad. Tony Sarg, marionette artist, Gertrude Brighton and Beatrice Fenton, famous sculptresses, and Lester Gaba, the soap sculptor, have contributed ideas and inspiration. Mr. Gaba drafted special directions for

carving a toad from soap for us, and also made us a signed toad model. Frank Jewett Mather told us of the only famous painting that contains a toad, "The Temptation of St. Anthony." We have collected many strange and interesting tales from explorers. The children possess enchanting documents from Mrs. Martin Johnson; from Mary Hastings Bradley, the first white woman to live among the pygmies; from Major Anthony Fiala, Polar explorer who accompanied Theodore Roosevelt in his journey through the Brazilian wilderness. Legends and superstitions, as well as scientific facts, are collected with equal enthusiasm.

A toad ballet, directed by the local dancing teacher, with the children as performers, is held in one of the moving picture theaters whenever we can afford to buy costumes and scenery. Our theaters sometimes give toad matinees, to which the price of admission is one live toad. These animals are subsequently given to country clubs for insect control on golf courses.

Our toad museum covers a wide variety of specimens, including tiny toad dolls and large toad cushions. There is a door knocker with a brass toad holding a ball in its hands. It was brought by a friend from Chester, England. Information and pictures of toads are being added from famous places throughout the country, so the geography of toaddom plays its part.

THE AUTHOR AND SOME TOADS
Originator of "Protect the Toad Week", she even wears a little bronze toad ornament on her hat

Tin cookie cutters in the shape of toads were designed and made by Waycross craftsmen, and are used to cut out the cookies that we serve with ice cream molded in toad form at school luncheons during Protect the Toad Week. Adorning our tables are toad place-cards made by the school arts department. The art students also make posters that we exhibit in store windows during our observance.

Toads as elements of design in stained glass windows may seem to be an impossible goal, but we have recently found one! It is in one of the famous sea-food restaurants in Baltimore. While we suspect that these toads may really have been meant for frogs to advertise frogs' legs, nevertheless we prefer to claim them as toads.

Jewelers have been found frequently to make use of the toad as a motif for silver and gold objects. Prehistoric man set this tradition, for toads fashioned from precious minerals have been excavated in both the Old and the New World from civilizations dead these many thousands of years.

Pottery has been an even more prolific source of toad design. The ancient peoples of Mexico delighted in the use of animals on their ceremonial jugs, and toads are not at all rare in archeological findings from the whole of tropical America. A toad temple still exists north of Mexico City at Tamazunchale. A toad fountain in the garden of the Pan American Union in Washington, D. C., exemplifies the Aztec artist's ability to represent accurately the actual form of the animal. We hope to find some toads in the gargoyles of cathedrals and church carvings of ancient European structures, but so far we have not come upon any.

A vast map of the world to cover one whole wall of our proposed museum is being planned. It will have small paintings of every known kind of toad, attached to the area of the map in which they occur—a toad geography of the world.

Our goal gleams ever ahead of us. We want to make every community toad-conscious, so that these innocent protectors of our gardens may be themselves protected from the danger of extermination that grows greater and greater.

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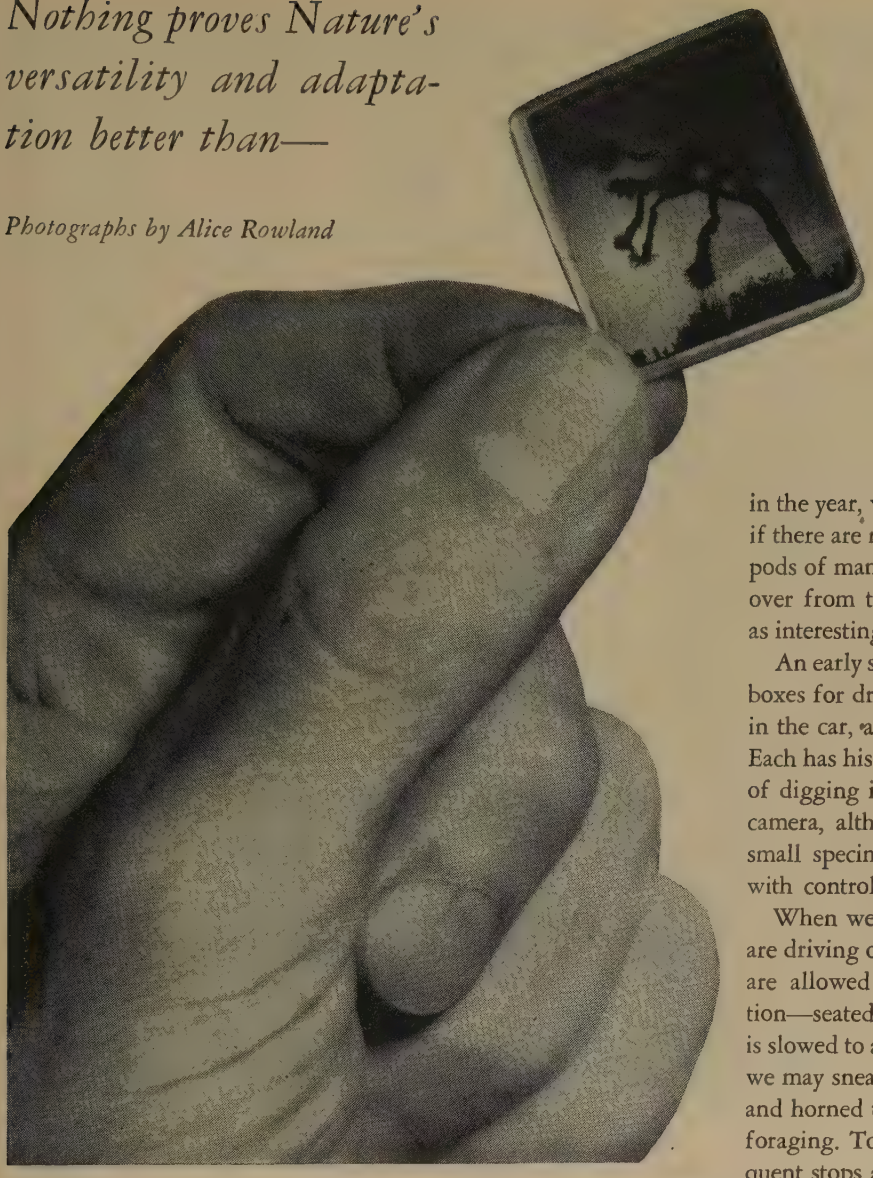
ANSWER REQUESTED

By ETHEL ROMIG FULLER

Is this lone ebon mountain peak
A question mark
Or an exclamation point
At the end
Of the valley's green paragraph?

Nothing proves Nature's versatility and adaptation better than—

Photographs by Alice Rowland



One Square Inch of Desert

By CARLYLE ELLIS

PERHAPS a magnifying glass will reveal no more plant wonders on the desert than it will anywhere else—in one's own back yard, for example. But the desert has its own way of being odd and spectacular in very small packages, so a square inch is a good size for framing any number of curiosities.

Young Jan and David, visitors from the city, were in on these square-inch explorations of mine, and on several days they have been off on their own, bringing in many specimens that come within the allotted space. To fix this space we straightened and bent paper clips with pliers till we had a supply of the inch-square metal frames. If a specimen looked interesting in this size it might be included in our collection and photographed in closeup.

Jan and David are new to the desert and it has given them, as it has many others, their first keen taste for natural history. I am scarcely awake in the morning before their knock comes to my door.

"It's a swell morning to go botanizing, Skipper."

One cannot honestly disagree with that. The early mornings are clear and cool almost every day, even in midsummer, and there are good botanizing days every month in the year, with plenty of loot to be found. Even if there are no flowers in bloom we will find seed pods of many sorts, and skeletal remains that last over from the flowering season and tell us just as interesting a story as the plant did in its prime.

An early start is made. Our equipment includes boxes for dry specimens, and, since we are going in the car, a pail with water for growing plants. Each has his own magnifying glass and some sort of digging instrument. One must not forget the camera, although it is better to photograph the small specimens at home, out of the wind and with controlled lighting.

When we have left the highways behind and are driving over unfrequented dirt roads the boys are allowed to take their favorite lookout station—seated on the front fenders—and the car is slowed to a cautious fifteen miles an hour. Thus we may sneak up on jackrabbits, gophers, snakes and horned toads, to watch them silently at their foraging. To find plant specimens we make frequent stops and side trips afoot. Only by getting on intimate terms with desert or field will they give up their more interesting secrets. Most of our best finds were made when we actually sat on the ground and took plenty of time to look about.

Many people think that a desert is just bare rock and sand. That is true of only a few limited areas. Vegetation is a matter of water. Wherever there is rainfall you will find plants growing. Even in Death Valley, which averages less than two inches of rain a year, there are many wildflowers each spring. As the rainfall increases so does the growth. Here in Antelope Valley, with only the Sierra Madre range separating us from the Coast, our average fall is eight inches, yet we are undeniably a part of the desert. There is much plant life but it is all of the sorts found only in arid regions. Scarcely any of our species grow on the moister coastal side of the mountains, twenty-five miles away.

With so little water Nature has learned to economize. Often she does this by keeping everything down to miniature size. We found many flowers so minute that we could not tell they were flowers until we used the magnifying glass. It would take several hundred of these blossoms

RATTLESNAKE MAT

This plant lies flat on smooth ground and may be a foot in diameter but only a half-inch deep. Thirty-six flowers in a square inch, peppered with red and white, irregular blossoms

to cover a square inch. That was their normal size. Others are merely larger plants stunted by lack of plant food. They are not, however, deformed. Every detail is perfect, but in miniature.

We found California poppy plants that instead of being a foot tall were scarcely two inches tall. Yet Nature was so determined to finish without flaw that the plants were in perfect proportion, with exquisite little blossoms of full color and normal shape. We wondered what the tiny seeds would bring forth if planted in good, moist soil.

Other plants have become permanent dwarfs. We hunted for the smallest. It was complete with stem, leaves, blossoms and buds. It stood stiffly erect, and the top was just three quarters of an inch from the ground. It would have looked almost lost in our inch frame but it wilted almost instantly when we tried to move it.

Mere smallness, however, is not the most interesting thing about plants. We were more thrilled at finding oddities of form. There is filaree, for example, which is not just a desert plant. It came all the way from Europe. It is a member of the geranium family, and is called heron's bill because of its long-beaked fruits. They are out of all proportion to the little, lavender flowers. The beaks when dry separate into five snake-like tails about two inches long. Each tail is attached to a seed and curls into a tight spring with a curved end. The purpose is probably to give the wind a chance to blow them away so that they will find new ground to seed. You will find that many plants in your neighborhood have appendages of one sort or another for this purpose, and it is interesting to list them.

Our boys found that if they put the filaree seeds in water the curl would come out until they looked like pollywogs with long, straight tails. When these were spread out on blotting paper they would soon squirm back into curl. If two or three were laid together the tails would wind around each other with a stranglehold that, under the magnifying glass looked like a miniature snake battle.

In the late summer and autumn we collected seeds and made a mixture. We included more than fifty kinds and, with a low-power microscope, found that every sort was different and most of them had marked oddities of shape

SEEDS OF FILAREE, *ERODIUM CICUTARIUM*

The long, hairy tails screw into spirals when the seeds escape, straighten in water and rewind when dry

DESERT WILDFLOWER SEEDS
The collection here shows how varied they are in form and color, good proof also of Nature's versatility in the plant world

and surface. As there are about eight hundred species of wildflowers growing on the desert we decided that Nature must be a remarkably clever designer if she could invent that many seeds.

As a matter of fact Nature differentiates the seeds of any locality as much as she does ours. It is this surpassing skill in making differences, not only in seeds but in flowers, fruit and leaves, that makes plant study so much fun. Nature keeps us in a constant state of wonder, and that is a good state to live in.

Especially do we wonder at the exquisite perfection of very small forms. Jan and David have acquired a lively admiration for the growing things they discover with their pocket lenses, and that delights me.

It is easy to take a weed as a matter of course and therefore to be scornful of it. We three are learning better. A weed seed may be so well equipped for flying that it will cover miles without an engine. That to me is just as wonderful in its way as a flying fortress. I like my boys to be thrilled by the big airplane, but I am even more pleased when they notice, too, that Nature is no slouch as an inventor, engineer and artist. For, after all, Nature's works are fundamental in the lives of all of us, everywhere.

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Royalty in America

By RUTH SEYMOUR VESELY

Once I beheld the descendant of emperors
Dining alone.
Where were his bodyguards, servants and courtiers?
Where was his throne?

His proud little head wore a polished bronze helmet;
His eyes were red-rimmed and remote.
A glittering sapphire and emerald collar
Adorned the white band on his throat,
And purple and copper embroideries shaded
The delicate stuff of his coat.

(Suddenly he saw me, and the Chinese pheasant spread his wings, straightened his incredible twenty-inch tail, and flew majestically away from that field of alfalfa.)

PUNCH AND JUDY LEER AT EACH OTHER
They have been doing so for a million years or more in this area noted for its strange formations and varied life

Chiricahua National Monument in Southeast Arizona is a—

Wonderland of Rocks

Photographs by Josef Muench

By JOYCE ROCKWOOD MUENCH

THE SITE of this monument, in the Chiricahua or Turkey Mountains in the southeast corner of Arizona, the Indians call "Tsay-ya-de-suit" or Point of Rocks. The white man has clung to Chiricahua, another Indian word, but has added his own sub-title, "Wonderland of Rocks", in explanation. This region, a National Monument since 1924, has a geological history that is full of interest, and the visitor turns to it eagerly for explanation of the strange formations to be found there.

We are told that in early Tertiary times there was a lake bed. Huge mastodons fed on the lush vegetation. As time and changing vegetation pushed these animals from the scene, there followed a period when flows of lava were thrust up through the crust of the earth. After each upthrust the hot lava cooled quickly, fusing with the lake bed. Evidence of this fusion is still to be seen along the roadside in Bonita Canyon, where lines of gypsum appear. The dacite and rhyolite rocks were not thoroughly blended during this period and gas made holes in the mixture. In the cooling process, an intricate system of cracks developed; vertical, horizontal and angular. When the wind-borne sand beat upon the rock mixture through the succeeding centuries, strange shapes were whittled out.

Another agency in erosion was seeping water, which dissolved minerals in some layers and dropped them to lower places. Different degrees of hardness were thus

ROCK MONUMENTS AND TREES MARCH UP AND DOWN THE MOUNTAIN SIDES TOGETHER

The rhyolite and dacite formations have seen countless forests come and go in the centuries since the region was a lake bed and the feeding place of mastodons

accentuated. The softest layers gave way first unless they were protected by harder strata above them. Thin necks, found so frequently, are the remains of the softer layers least able to withstand the elements. So careful a workman was Nature that in the case of the Big Balanced Rock a weight of 652 tons is set on a point only four feet, three inches in diameter. The mass, twenty-five feet high and twenty-two feet wide, seems to rest lightly on its base. Pinnacle Balanced Rock, while not quite so spectacular, seems to be ready for flight at the merest push. These rocks were in formation longer than the Grand Canyon, and are now, in general, only two thirds eroded.

Whole battalions of "rock soldiers" meet ready to march up the hill and then down again. One vista, from which can be seen the group known as Cochise's Warriors, gives the visitor a strange feeling of unity and power. Yet no two formations seem quite alike. Punch and Judy are two rollicksome figures that gibe at each other across the years.

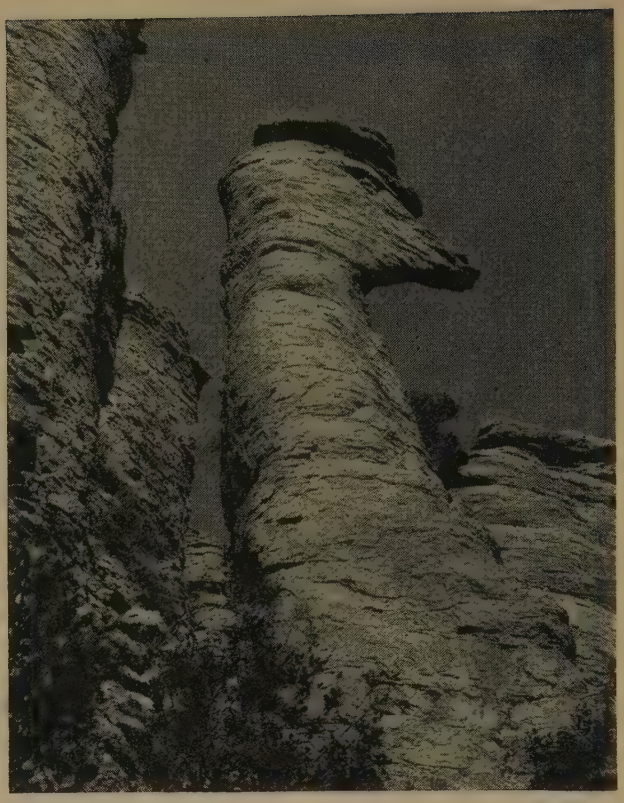
If one could ever exhaust the delights of the rock menagerie he would still find a-plenty of interest in Chiricahua. Ora M. Clark, botanist-ranger, has collected, in the past several years, some 500 different species of plants. While yet incomplete, this collection indicates that the Chiricahuas, like many isolated ranges, form somewhat of a biological island. Bounded by Sulphur Springs Valley on the west, and San Simon Valley on the east and north, it contains species of plants and animals strongly characteristic of other distant regions.

In general, it is a bit of old Mexico. Mexican cotton and two varieties of wild potato are seen here. Beside these plants common to the surrounding area is, for example, a fern not to be found closer than 300 miles south in our neighbor republic. Red *Bouvardia,* a genus with many species in Mexico, is found here. A red columbine, almost identical with that of the Ozark Mountains of Missouri, grows in the Chiricahuas.

The fauna, too, shows affinities to that of Mexico. The Mexican *tigre,* the jaguar, fiercest of the cat tribe, has wandered in from Mexico. Chiricahua is probably the only place in the United States where the thick-billed parrot has been seen. At irregular intervals flocks from Mexico invade the Chiricahuas to feed on the seeds of the pines. Tree and ground squirrels are abundant on the slopes of the mountains.

Chiricahua National Monument covers an area of 10,694 acres and is situated in the extreme northern end of the Chiricahua Mountains. They were the scene of many stirring encounters between the white man and the Apache

PINNACLE BALANCED ROCK
It looks as though a puff of wind would blow it from its pedestal but it has been in the making for uncountable thousands of years



DONALD, THE DUCK
The rock formations are beautifully tinted in yellows and greens by the fungus that grows upon them. This is one of the most amusing rocks

Indian. Many points and promontories are named after Indians. Massai Point, at the end of the road that runs through the monument, rising from 5320 feet, at the entrance near the headquarters building, to 6781 feet at the summit, is named for an Apache, Big Foot Massai. Cochise's Head is a mountain in itself and can be seen from Massai Point. In the bare rock that forms its crest are the clear cut features of an Indian's profile. It commemorates the life of the last of the great Apache chiefs, leader of the Western Nation of Apaches. Within man's memory he was a power in the land wrested from his people.

The monument is administered by the National Park Service, and there is a fine system of trails that carry the hiker or horseback rider to most of the best known groups of rock monuments. A public campground is maintained within the boundary, and a fine dude ranch is operated close by.

In Chiricahua there is opportunity to study Nature in many of her phases, and to all, whether learned or unversed in geology, botany, or history, she offers her quiet stretches of forests, her matchless vistas, and her air of ageless serenity—a tonic in these days of war and destruction.

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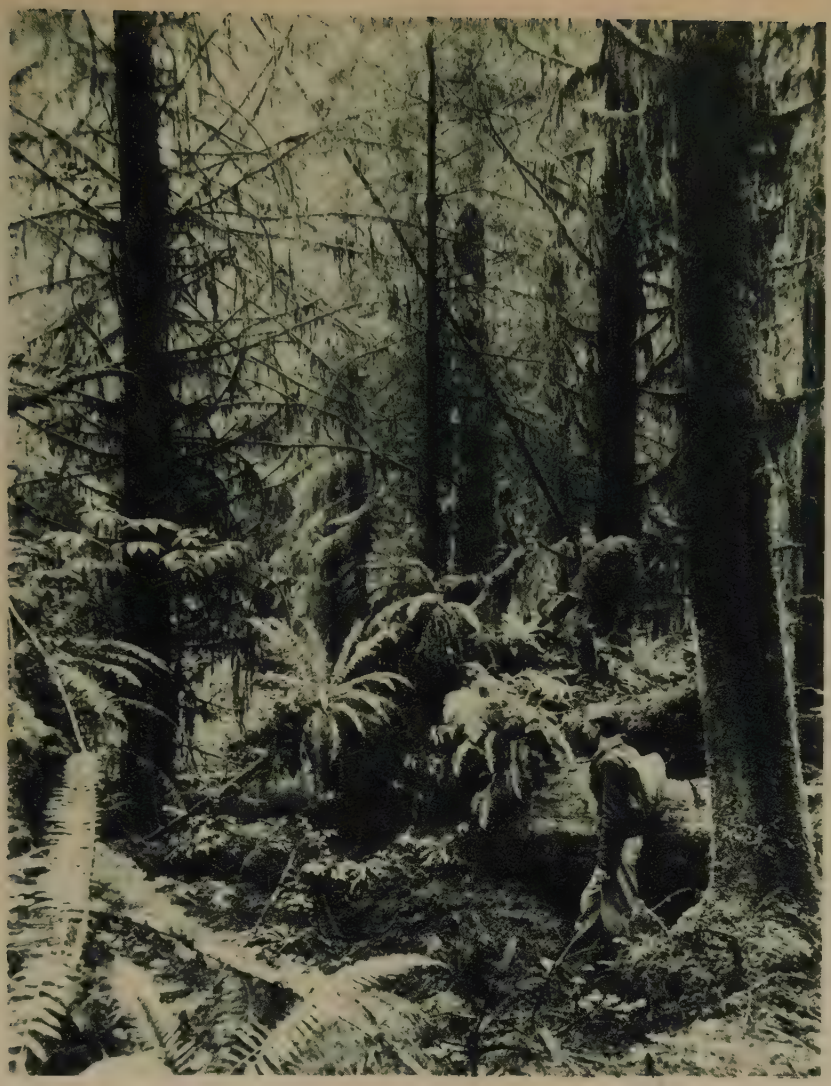
I Stay With These

By EARLE FRANKLIN BAKER

While warring ships wing through the skies
I plow and tend the awaking scented land,
And hear the geese as northward go their cries
To familiar climes and peaceful weedy strands.
While my seed-plants drink the April-splashing rain,
Only War and fear and death seem really true,
I close my farm-house and tramp my loamy plains;
The trees bud out; beneath God's cloudless blue,
And bluebirds come where winds stir from the sea
To blow through trumpets of the lordly pines.

I walk down greensward slopes to watch a start
Of daffodils come to life; watch many lines
Of stubborn grass press lingering snows apart,
My fruitful fields pour treasure everywhere, the whine
Of a plane recalls my dream to wander far away
To foreign climes and stranger shores than these,
I sigh and watch the sun bring the end of day,
So, peaceful like, I stay with these:
Where the dome of night is spread with stars
And my cattle rest by the rail draw-bars.



RAIN FOREST

Photographs by Devereux Butcher

Nowhere else in North America is there a forest like the one that covers the lower western slopes of the Olympic Mountains in the State of Washington. Here an average annual rainfall of 142 inches, together with a mild climate that permits a long growing season, make it possible for vegetation to attain almost tropical luxuriance. This is known as the Olympic Rain Forest.

The pictures on these pages were taken outside the boundaries of the new Olympic National Park but within the boundaries of the Olympic National Forest, which virtually surrounds this Park. The photographer and his wife made their way into this great rain forest from the south shore of Quinault Lake and spent some time in study of this immediate section.

In such a forest, of course, ferns and mosses of luxuriant growth abound. In the picture at the top of the page we see a combination of forest tree and undergrowth typical of this section. At the left is one of the more common mosses found in the Olympic Rain Forest. It is a fern-like moss known to botanists as *Eurhynchium oreganum*. The specimen photographed was growing on the side of a rotting stump.

In the following pages we see more of this forest.

The long fronds of the sword fern, *Polystichum munitum*, are found throughout the Olympic Rain Forest (left, above). On the ground around this clump are the leaves of oxalis, while in a crevice of bark on the western red cedar there grows a seedling hemlock, which, by its position, gives proof of the abundance of moisture. Perhaps the most beautiful fern of the Olympic Rain Forest is the deer fern, *Blechnum spicant*, its bright green fronds spreading in a whorl with a tall fruiting stalk rising from the center. The ground on which this plant grows is a solid mat of moss. In the picture at the left, below, is a bit of cliff at Falls Creek decked with western maidenhair fern, *Adiantum pedatum aleuticum*. This fern usually follows the water courses, and is not common elsewhere in the forest. One of the strangest lichens in the forest is *Peltigera canina*, with its center of dark umber grading to gray, with light tan fruiting bodies along the outer edge. This specimen was found in Willaby Gorge.

The steep sides of Willaby Creek Gorge in the Olympic Rain Forest are decked in a wealth of vegetation. Here are vine maple at the lower left and the tiny leaves of oxalis at the right above it. Great plants of sword fern are scattered about, and on the ledge are plants of western maidenhair fern.

On rocky outcroppings along the shore of Lake Quinault may be seen an odd gray lichen distinguished by its black fruiting tips. It belongs to that numerous lichen genus described at considerable length in the November, 1941, issue of Nature Magazine, and is called *Cladonia acuminata*. Below, at the left, is one of the most beautiful of the mosses in the Olympic Rain Forest, the pale green *Nekera pennata*, here covering the base of a tree. The principal trees of the Forest are western red cedar, Sitka spruce, Douglas fir and silver fir, and western hemlock. Some of the oldest individuals are three hundred feet high. The large tree at the right of the picture below is a splendid western red cedar.

The dog violet, *Viola conspersa*, a slender, leafy-stemmed plant bearing numerous pale purplish or white flowers. It often blooms in abundance along moist roadsides and in damp open woodlands, where it may be found in late May accompanied by the unfolding fronds of the lady fern. This, and the other photographs in this series, were all taken within a mile or two of the author's home in Franklin County, Massachusetts.

Violets in their Native Haunts

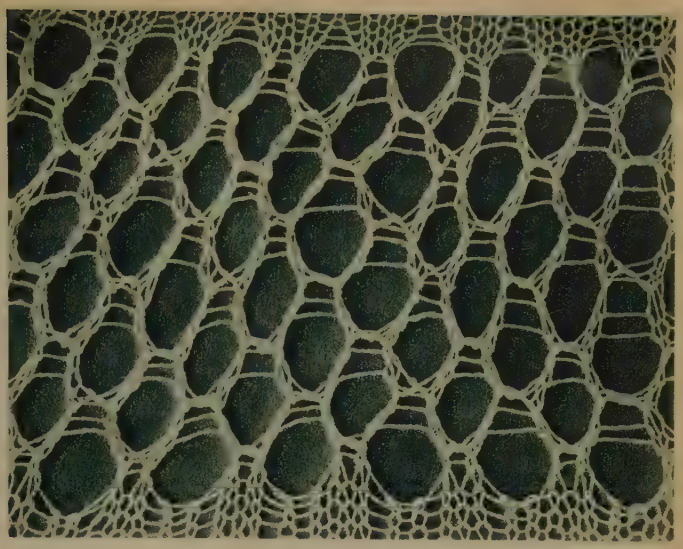
Photographs by S. Judson Ewer

Spring is not far away, and spring means violets. Two of these are the downy yellow violet at the left, which gets its Latin name of *Viola pubescens* from the abundant soft hairs that clothe the stems and leaves. The large flowers are yellow, with purple veining. This violet is found in the moist woodlands from Nova Scotia southward to the mountains of Virginia, and westward to Missouri. The long-spurred violet, *Viola rostrata*, usually grows in rocky, open places, where its leafy stems and large purplish flowers are outstanding. The slender spur attains nearly one-half an inch in length and accounts for the popular name of "honeysuckle" violet.

The round-leaved violet, *Viola rotundifolia*, above, is a true harbinger of spring, producing its small bright yellow flowers in early April. The shiny green leaves grow from the base of the plant, continuing to grow flat on the ground after the flowering season. The sweet violet, *Viola blanda*, at the left, is small-flowered and common to the spring woodlands and on moist banks from Quebec to the mountains of Georgia. The reddish peduncles and narrow, twisted upper petals distinguish it from the northern white violet, *Viola pallens*.

The early blue violet, *Viola sagittata ovata* right, is, in its varying forms, a common spring wild flower in dry pastures and on open hillsides from Nova Scotia south to Georgia. Its pale purple flowers, rather large for the plant, are set on stout, hairy peduncles. The English violet, *Viola odorata*, is not native to this country, and this photograph is of a garden specimen. It is often found cultivated and sometimes escapes to nearby roadsides. An early bloomer, it is sweet-scented, and its numerous creeping stems enable the plants to spread rapidly.

MAGNIFIED VIEW OF THE GRASSHOPPER'S WING

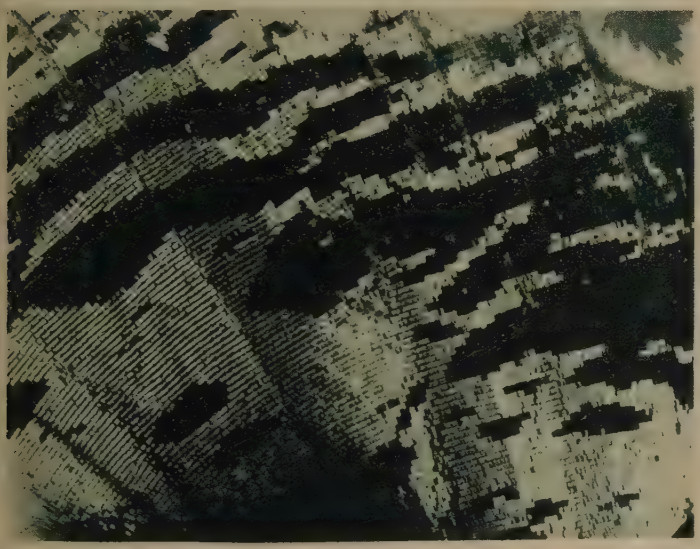


A KNITTED COVER THAT RESEMBLES IT SOMEWHAT

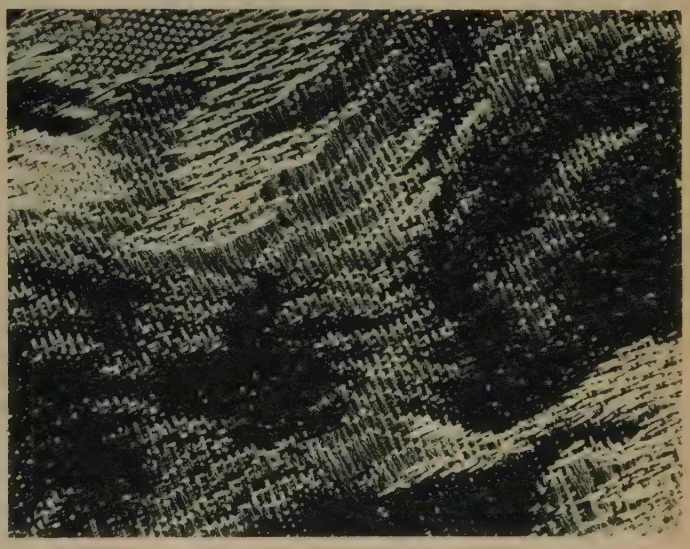
NATURE AND ART

In the pictures at the left on this page and the next are examples of Nature's artistry in designing the wings of butterflies, moths and other insects. In the pictures at the right are examples of how man may turn to Nature for design and for ideas for textures. To the sculptor, artist, designer and other craftsmen, Nature has been a source of inspiration in many ways.

Textiles provide graphic examples of this sort of col-



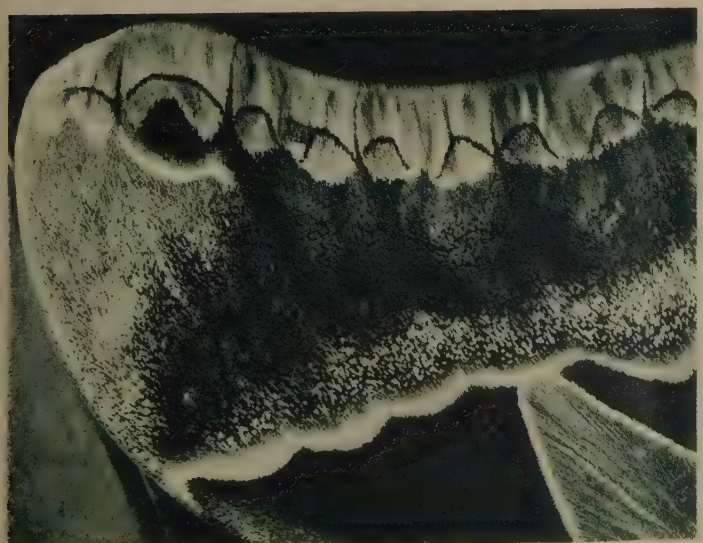
URANIA, DIURNAL MOTH, WEST INDIES AND S. AMERICA

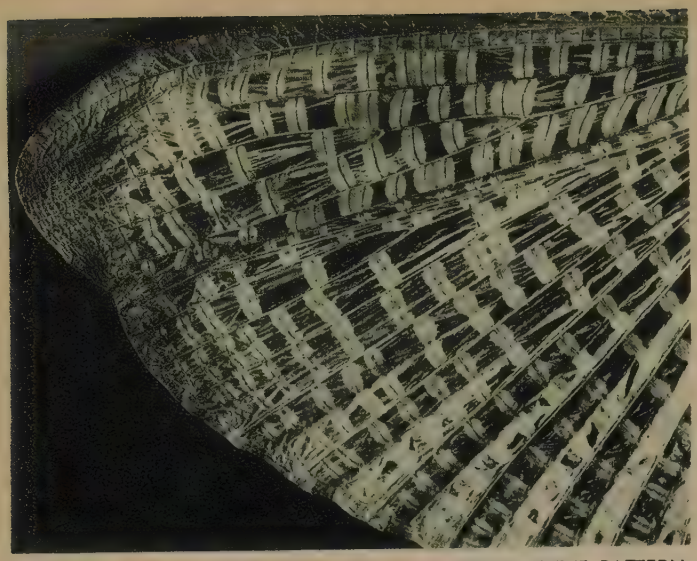


TABLECLOTH PATTERN, DESIGNED FROM NATURE

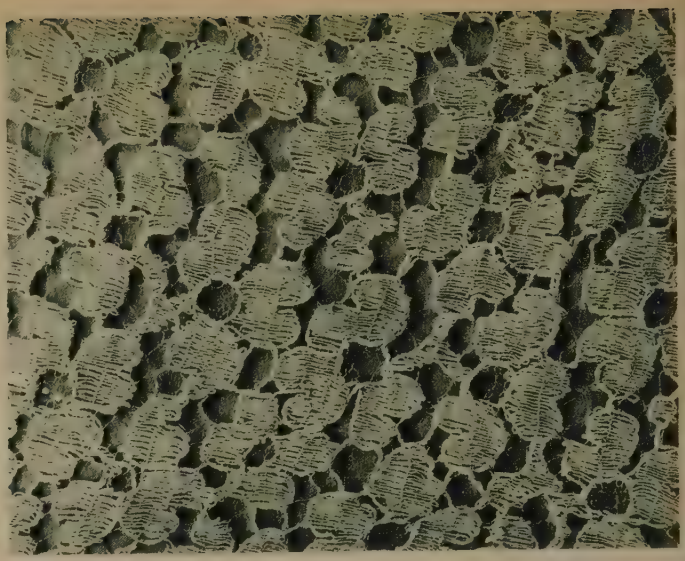
(BELOW) WING OF AN ASIATIC SILK MOTH, *ATTACUS*

PERHAPS THIS BED-SPREAD WAS SUGGESTED BY ITS WING

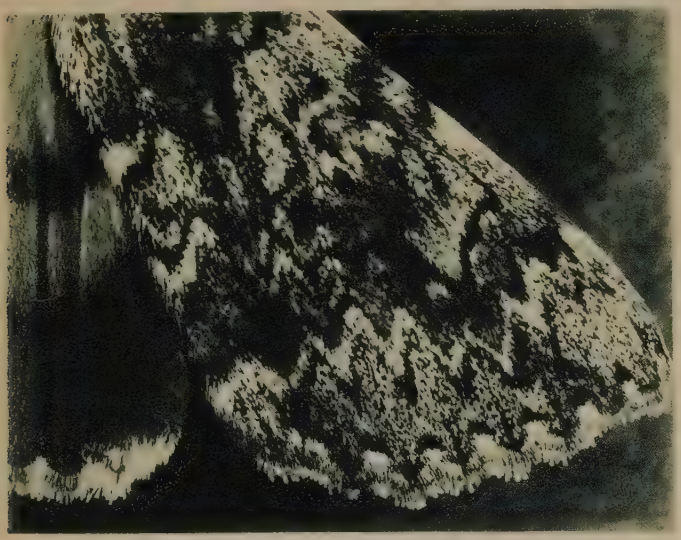




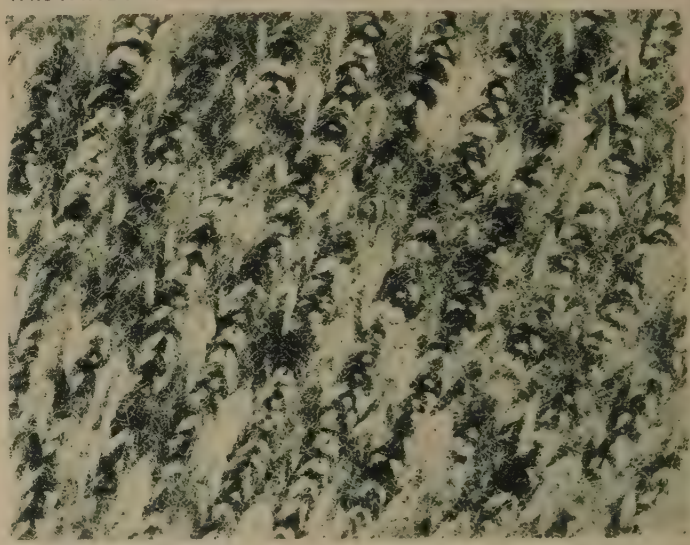
WING OF PRAYING MANTIS HAS A DISTINCTIVE PATTERN



THIS PATTERN SUGGESTS A MANTIS WING TO SOME DEGREE



ONE OF THE "UNDERWING" MOTHS, *CATOCALA*



THIS WOOLEN MITTEN PATTERN MIGHT BE OFTEN VARIED

laboration. Not only has man adopted some of Nature's ideas in color combination and design, but he has seen the possibilities in texture effects. Stitches in a woven material are as important as its design, so, for example, a knitted bed cover adopts the formation that we find through a careful study of the manner in which a grasshopper's wing is constructed.

The widest possibilities, however, seem to be offered by the wings of moths and butterflies. In these Nature has blended color and design with results of outstanding beauty. The patterns are soft and pleasing, and their arrangement and colors spell perfection. We believe that the opportunities are almost endless in the use of the colors and wing patterns of these and other insects in designing carpets, laces, hangings, bedspreads and many other things that make our homes charming and in good taste. A look around your living room and bedroom will disclose many designs that owe their original ideas to Nature. And you, yourself, can delve further to your heart's content.

At the bottom of this page are the wings of three insects that offer suggestion to any textile designer. It is not difficult to picture these transformed into dress patterns or into draperies. Our debt to Nature is infinite.

THE *THAIS* BUTTERFLY FROM SOUTHERN EUROPE AND ASIA SUGGESTS DESIGNS OF BEAUTY

THIS GIANT SILK-MOTH MIGHT BE ADAPTED TO THE MAKING OF A CURTAIN DESIGN

THE UNDER SIDE OF *EUMAEUS DEBORA* FROM MEXICO HAS GREAT POSSIBILITIES

As We See It

NATURE, MAN AND WAR ★ ★

Since Nature has a sense of humor, she must now be enjoying some grim laughter as she watches man and his puny antics. She must chuckle at his squirmings as he strives to adjust his imperfect social and economic structure to the penalties that have come from his destructive use of Nature's gifts—things that man broadly describes as natural resources.

Nature planted rubber trees in the jungles of Brazil. Man moved them to the East Indies where they have prospered commercially. Now they are threatened by war.

Nature stored oil in the ground. Man created nations, and now thousands die to get this wealth, and other thousands perish in its protection.

Nature cached metallic wealth beneath the surface of the soil, and planted trees and food-bearing plants above it. Man built his economic existence around these, and yet so faulty is his planning, and so weak his social character, that he cannot contrive to live at peace among all this wealth.

Through all history man has fought wars, and has never been able to rise above war's level in solving the problems of the world. All have been wars of conquest. Even when led by an Alexander, a Caesar, a Napoleon, or a Hitler, they have been wars to get what his fellow-man has; what the aggressor does not have.

Thus, at the root of it all—man and his resources alike—lies Nature. The natural wealth of the world is fundamental. The products of mine, forest, field and water are the basic wealth. In using these man has been criminally wasteful. He has turned his inventive genius to making numberless things from them, and because of these has come to consider himself as the creator of everything. And yet, with it all, he has not developed the power to adapt himself to the environment he has himself evolved. He has not learned even to pick as rulers those who would give him peace.

What will follow this present war is anyone's guess. The sores of ancient hatreds have been opened; new ones have become infected. Revenge and retribution will find places at the peace table. In 1919 they charted the way for the events that led up to the world conflict of today. Let us all hope that, when the aggressors of the moment have been checked and their false prophets and shallow leaders are surrendered to the calumny of history, true vision will find itself in the hearts of those who make the peace.

This vision must be based upon recognition of man's right to live in relative security and comfort in proportion to the effort he expends to gain such security. It must be based upon the realization that the world's priceless wealth in natural resources must be more widely available. Promise of this is to be found in the "Atlantic Charter" approved by Franklin D. Roosevelt and Winston Churchill. This promise must not be lost in the welter of a vengeful peace.

In North America, during the past two decades, we have learned much of the importance of planning and wise use of natural resources. We have agencies for the study of this complex but vital subject. We have much more to learn, and, beyond that, we face the more difficult task of applying our knowledge and fitting it to the social and economic lives of all peoples.

Of all the developments of Nature, man is the most difficult. Plants and animals in Nature have an amazing ability to develop adaptation and tolerance to their environments. We see evidence of this all about us. Plants from distant places and climates become naturalized to vastly different situations. Birds and mammals have adjusted themselves to man's civilization to whatever extent man permits. Yet man has found it impossible to develop even a tolerance toward his human neighbors.

So, as we fight this war and endure privations to the end that those nations that possess the most enlightened view of individual happiness and security may be able to carry on to further progress, we must anticipate the responsibilities of victory. In the process of war we must not neglect our thinking of the peace. We must try to find in our present experience the fundamental reasons why we must triumph. We must temper in the furnace of war the fine tools that will fashion a peace alloyed with a sense of our responsibility to share the great wealth that Nature has bestowed upon a world so fruitful that man *must* evolve a peaceful civilization—or *perish.*

Conservation Comment

As a sort of outdoor "museum piece", a tract of about a square mile of virgin forest of the coastal spruce-hemlock type has been designated as a Natural Area by the United States Forest Service. This tract is situated on an Oregon ocean cliff just north of Neskowin Crest and is a part of the Siuslaw National Forest. The area is one of nine such tracts set aside formally to preserve typical examples of old growth forest. Similar areas that would preserve typical stands of ponderosa pine, Douglas fir and western red cedar are under consideration. Virgin stands of our western lumber species are becoming more and more difficult to find and the war demands will place a burden on these, so if more natural areas are to be created, the quicker the better.

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Through an ordinance adopted by the State Highway and Public Works Commission of North Carolina all advertising signs and billboards must not be closer than fifty feet of the center line of the highway. While this is not a great set-back of the signs, the regulation is based squarely on the question of safety. The Commission declares that "a multiplicity of signs in close proximity to the state highways tend to obscure and distract the attention of the motorist from the necessary warning and traffic signs." It is time that other states recognized this menace.

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Bird banding has revealed many interesting and important facts about birds, and a recent report from Canada further indicates the hazards in a duck's life. A band turned in to the Canadian Department of Mines and Resources revealed that a black duck had wintered in the safety of the New York Zoological Park in heavily-populated New York City and had been banded there in 1939. It apparently had good luck during 1940, but it was shot in the autumn of 1941 in a sparsely-settled region of northern Ontario. It appears that cities are safer.

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A new wild area in the Malheur National Forest of Oregon, to be known as the Strawberry Mountain Wild Area, has been tentatively approved by the United States Forest Service. It includes 31,760 acres in which practically all of the eastern Oregon forest type of trees occur. It is a summer range for mule deer and a few black bears are found there. It once supported a band of bighorn sheep. Classification of this tract as a wild area prohibits commercial timber cutting, hotels, resorts and road construction and the area will be maintained in primitive condition.

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"Watch out for the old 'cooperation' hocus-pocus, the final trick in the bottom of the outdoor advertiser's barrel." This is the warning sounded by Thomas C. Desmond, New York State Senator and leader in the fight for proper regulation of the roadsides in his State. Writing in the Bulletin of the National Council of State Garden Clubs, he goes on to say: "Several times a promising drive for billboard regulation has been slackened or called off entirely by well-meaning but thoroughly inexperienced groups who harkened to the siren song: 'Just let us alone and we'll clean up the situation ourselves.'. . . In no case where such a promise has been accepted in good faith has there been any genuine effort to fulfill it, or evidence of any real intention even to attempt it. As a result, a sadly disillusioned group of idealists would find themselves under the necessity of resuming the drive after several years of complacent idleness had made the task tenfold more difficult. Effective regulation of the billboards will not come about by mere agreement. 'Appeasement' won't work here, either."

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At the time of going to press no change had been made in the ruling that the 385 or so employees of the Fish and Wildlife Service must move out of Washington to Chicago. A revolt in Congress failed to gain momentum and the President closed the door to any revision in the plans of transfer of the various agencies selected for exile. There still remained a faint hope that quarters might be provided on the Patuxent Wildlife Refuge of the Service, some twenty miles from Washington, or in one of the buildings at the University of Maryland, even closer. The interests of conservation, however, seemed to be rather definitely lost in the shuffle.

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Muskrats are putting Cajun trappers of St. Bernard Parish, Louisiana, on their feet—muskrats and the Farm Security Administration. Formerly these trappers leased trapping lands and delivered the skins to the landowner. Then the FSA came along, loaned them a half million dollars to buy 30,000 acres of trapping lands. That was three years ago. Today the trappers have retired half this debt and fifty of 186 families have paid up their shares in full. With a good season this winter the FSA expected most of the debt to be cleared up. In addition most of the families have been able to diversify their activities, develop farms and raise poultry.

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Sessions of the Seventh North American Wildlife Conference will be held in Toronto, Canada, from April 8 to 10. Headquarters will be at the Royal York Hotel. General sessions of the Conference will deal with current wildlife problems, particularly with relation to war times. There will be several technical sessions, and a number of related meetings will be held at the time of the Conference, including that of the Outdoor Writers Association.

On his sanctuary in Canada, beside mourning doves and geese—

Jack Miner's Raising Wood Ducks

By GRACE V. SHARRITT

JACK MINER

IN Canada, about twenty-five miles from Detroit, a keen, blue-eyed, white-haired man is quietly increasing the wood duck population. His name is Jack Miner—a man who needs no introduction to most outdoor people. His wildlife sanctuary, first of its kind in Canada, and early among the pioneer wildlife refuges in the United States, has been responsible for the protection of uncounted and uncountable migratory geese and ducks.

It was back in 1909 that Jack Miner first began banding birds. Scripture passages were traced on the aluminum strips that encircled the legs of the few stray Canada geese and black ducks that flew from nearby Lake Erie to his farm for the tempting yellow corn he scattered about the barnyard. To date, thirty-five hundred of these banded gospel messages have been returned to the Canadian sanctuary from hunters who have shot the birds in widely scattered sections of the continent.

About ten years ago Jack started experimenting with wood ducks. He established "nail-keg" homes for these tree-nesting ducks, picking choice nesting sites throughout his sanctuary. But some of the homes were not used, so the Miners, father and sons, tried another housing experiment. They constructed ducky little cottages of tile for their discriminating feathered renters. These homes, made of red clay tile—a product kilned from the clay pits on the Miner place—have a small pipe-like entrance-tile set to and cemented around the opening of a larger upright tile. In the earlier years, the homes were placed on the ground. However, the Madame Wood Ducks would have little to do with a ground dwelling, no matter how stunning the architecture. Primitive instinct demanded that they rear their babies at tree-top level. Finally Jack put the houses on poles and fences and in the trees. Then everyone began to get results.

Jack told me of those early beginnings on the sunny October day when I visited his two-hundred-acre farm and sanctuary. I could see without being told some of the results of ten years in labor and love with the most gorgeously feathered duck on the North American continent. Male wood ducks, aristocratic in their vari-colored silk toppers and waistcoats, were as common at the sanctuary as robins on a suburban lawn in spring. Mammas in their more modest wardrobes of brown took the sun in the pond, while young sprouts played tag on the shores.

There were wood ducks in the trees, dozing or resting on bare limbs overhanging the pond. There were wood ducks rambling around the fenced-in yard with golden pheasants and whistling swans. Everywhere you looked in the yard and pond there were wood ducks. You almost, but really not quite, felt satiated with color and beauty.

JACK MINER LOVES BEAUTY—THE BEAUTY THAT IS OF BIRDS

Here he feeds a variety of his avian visitors or permanent residents in his Canadian sanctuary. Note the considerable group of wood ducks in the water, part of the quite important colony that lives with Jack

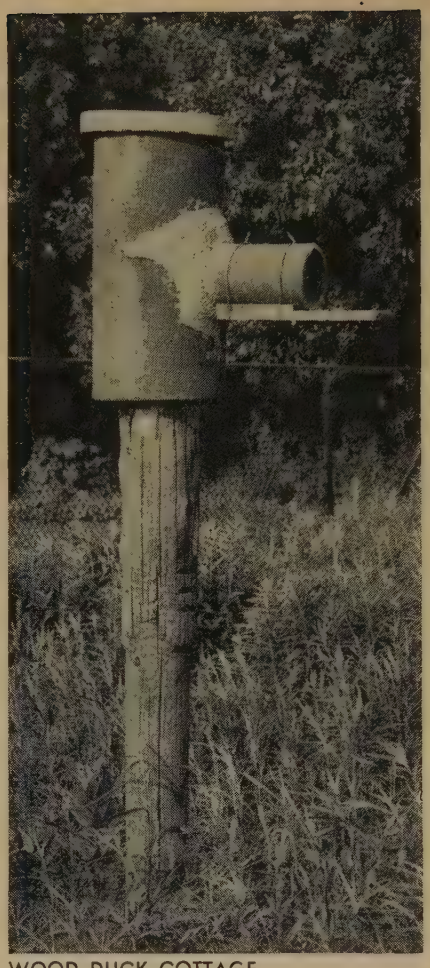
We fed the royal family cracked corn from a small milk bucket, the way you do Leghorns and Rhode Island Reds on a poultry farm. "How much corn," I suddenly asked, "does it take to feed all these ducks and geese that hang around your place?"

"Eighteen thousand bushels, or thereabouts, a year," Jack replied, and added, "Wood ducks like mulberries for food, too. That's why I've planted so many mulberry trees around the pond and the lake. The berries drop into the water and attract the ducks to come and to stay."

It seems that there are many tricks to wood duck breeding. This sort of game-bird propagation may become a fad with some, but with the Canadian Conservationist of Bluest Blood, his experiment is a dead serious project in wildlife management seeking to point the way for others interested in the wood duck's preservation.

"About how many red tile cottages are there on the place?" I questioned, as we walked down a long lane of pines to the blind on the lake.

"Between twenty-five and thirty," he replied. "But by using the gray 'call' ducks—a mixed-breed mallard—as setting hens, we get as high as three hatches each season."



WOOD DUCK COTTAGE
Made of red tile, it has a front porch and has proved to be a popular residence with visiting birds

In other words, the female wood ducks lay the eggs. The Miners take the eggs and put them under the bosoms of call ducks. The wood ducks get busy and lay other clutches. The gray call ducks begin hatching. The second layings of wood duck eggs are given to other gray ducks, and the assembly line keeps moving at full production the season through, from late April until July. Each one of these young is banded with a Miner scriptural passage on its leg.

The self-styled Boy Scout of seventy years walked faster than I could skip, talking rapidly all the way to the blind, a green, wooden observatory on stilts. A small open window faced the artificial lake and its deep background of Scotch pines. In this window hung a tin cup and two corncobs. They swayed gently in the soft October breeze, making a tiny tinkling sound.

"Scarecrows," Jack whispered, as I wondered aloud what these accessories were. "Foolers. It gets the birds used to any stray noise from the blind."

I sat on a burlap sack of grain on a hard pine board and peeked through the window. No silken cushion on a carved seat in a royal theatre could have seemed finer. For never, never had I been privileged to view such a show as I now witnessed through the peek-hole window. A stretch of blue water was dotted with feathered swimmers; Canada geese predominating, accented with blacks, mallards, teals and wood ducks. There were thousands of waterfowl in the lake and along the shores on that beautiful autumn day. It was high noon; the sun benevolently warm. A blue haze veiled the distant fields. This picture of protected wildlife was unforgettable. Memorable and inspiring was this rugged individualist seated on the pine board beside me, laughing at my amazement and remarking, "It would jar the cherries off Aunt Marthy's hat, the questions people ask me."

"Well, here's one," I said, willing to tumble a few more cherries off the old lady's bonnet. "Why don't the wood ducks like the 'nail-keg' houses?"

Jack didn't hazard a straight answer, but he explained that he believed the wood duck ladies liked a front porch to their homes for more privacy.

There were about fifty pairs of the wood ducks, however, that still nested *au naturel* in the trees about the sanctuary this past season. But these fifty were attracted by the colony of their own species.

Twenty-five pairs are permanent dwellers at the refuge. Jack loves beauty. He loves the beautiful in feathers, but those feathers must be alive, not museum-stuffed, to please this veteran.

When the days begin to shorten and that certain kind of purple mist creeps over the ponds and meadows, the young ducks become restless. Two hundred took wing this fall. Two hundred wood ducks may be, per that time-worn cliché, "just a grain of sand in the desert", in the long-range conservation of the species; however, it is a definite life-preserver of a kind.

And as Jack Miner said, as he waved his hand to me in farewell, "Seems like I haven't got started, or that I can't live long enough to accomplish all that I want to do." His blue eyes shone with purposeful plans still to be unfolded.

Jack Miner will be seventy-seven years young this April. He is in the throes of making a movie. It's titled "Jack Miner's Life Story". Gabriel Pascal, the English producer who stages the Bernard Shaw plays, is working with RKO and United Artists and Jack. Nothing shoddy about this great but simple-hearted man of the fields.

May he live to see the beautiful wood duck that was once almost an extinct species gather on his lake by the thousands, as the Canadas do now. Patience, love of wildlife, sacrifice and determination have blazed his path.

As though paying for the hurricane, Nature drops—

Golden Rain on New England

By M. A. HUBERMAN

HEAVILY LADEN WITH CONES
Branch of white pine showing the richness of potential trees that made the cone crop of 1941 so important

FOLKS hereabouts would have told you, but only if you had asked, that last year saw the heaviest white pine seed crop since the bumper year 1920. Of course there were several good years in between, but not bumper crops. Almost every tree that was old enough was bent with the precious load of new-trees-in-the-making. It was as though the Lord repented for the havoc wrought on New England's white pine forests by the hurricane of September 21, 1938. The awful mess of criss-crossed trees would make anyone wish to do something to restore the former green, peaceful farm woodlots, the pride and partial meal-ticket of many a thrifty New Englander.

In 1939 things began to happen in the sap, buds and branches of the pine trees. Hormones rushed from twig to twig; many swellings appeared, to become male pollen-bearing flowers and female cone-flowers. The heavy yellow dust, which causes hay-fever for some folks, "set" many, many cones that grew about an inch that summer and turned purple in the autumn of 1940. In the spring of 1941 these purple cones began to grow long and turned green, and then these green cones turned brown; a golden brown. And wherever you looked you could see almost every pine tree left standing by the hurricane top-heavy with its burden. The trees opened their cones, letting the seeds float lazily down on their brownish wings like welcome parachutists bringing supplies to a blitzed land. Many of the pine woodlots surely were blitzed by that wind, and most of the acres need supplies and more supplies of life-bearing seeds; for most of those blitzed acres are coming back to maple and other hardwoods that are not worth nearly as much in the war program as white pine boards for boxes and crates. Not all woodlots, of course, but too many of them are beginning to come back to less valuable species than before the hurricane. Some people spoke of planting white pines, but wiser heads suggested waiting a while. And then the golden harvest of 1941 came.

Each cone has about eighty seeds; each tree has anywhere from one to three bushels of cones. This means from 100,000 to 300,000 seeds per tree! Studies made as early as thirty years ago showed that these seeds could be expected to be borne by the wind one hundred to two hundred feet from the tree, and with good strong winds and favorable locations, such as ridges or slopes, the trees can send their winged messengers as far as half a mile, but two hundred feet or less is most common. That means that trees standing on the edge of blown-down patches will seed areas up to two acres in size. So the prospects are much brighter in the blown-down belt, if the farmers and woodlot owners will keep an eye out for the young pines and make sure that worthless hardwood does not choke out the little seedlings.

As for the rest of the white pine country of the northeast, such as western Maine, western Vermont, and northeastern New York, which escaped the hurricane blitz, much of this area is being blitzed in another way. The tremendous need for pine box and crate boards has started many a millman and wood buyer on his travels to offer nearby farmers lump-sum cash for all the timber on their woodlots. Very few farmers have taken the trouble to inform themselves about their tree crops in the same way they have learned about their farm and field crops. Consequently they take the word of the wood buyer as to the amount of wood on the lot; nothing is said about grading the logs that will be cut, and the farmers take the cash in a lump sum. The millman or buyer, having bought *all* the timber, then proceeds to strip the lot by cutting every tree, even those little fellows that yield no more than a two-by-

four and a streak of sawdust. The result is nearly as bad as if the hurricane had hit the woodlot, for only a few wispy broken-topped pines, crooked maples, and scrubby beeches and oaks are left. And, except for a few cords of fuelwood, the farmer has no prospect of any income from his woodlot for at least thirty or forty years. This brings back the subject of the bumper seed crop.

With heavy-bearing seed trees spared, the farmer can count on getting back a crop made up chiefly of pine. He can, without much difficulty, insist that the millman or buyer leave seed-bearing trees so spaced that no openings greater than two acres are within some source of seed. Of course this would probably mean that the wood buyer would offer somewhat less cash, but the woodlot owner would really be ahead for several reasons. Not only would there be a hope of getting young pine seedlings in the openings, but after these youngsters are well established, the farmer can then sell the seed trees.

Even better than this, of course, woodlot owners in many localities throughout New England could do what York County, Maine, farmers are doing. A number of them are convinced that this stripping of woodlots is poor business—poor for the owner because it leaves him without a future cut of timber; poor for the millman because it is unprofitable to try to make lumber out of trees smaller than ten inches in diameter; poor for the local communities that depend on summer visitors for much of their livelihood, because tourists do not want to come back to cut-over country with brush-covered or slash-covered woodlots; and poor for the nation's victory program, which will need white pine boxes and crates and construction lumber for a long time, even after the Nazis and Japs are put in their places. These Maine farmers have formed a cooperative called "The Farm Forest Products, Inc.", and hired a forester to cruise and mark their woodlots for selective cutting. Such cutting is helping them to cash in on the present market and still leave their better trees for the inevitable demand that will come after this war for high grade construction lumber. The cooperative arranges for careful logging so as to do the minimum damage to the trees left for future growth, and it arranges for sale of logs to mills that pay for the number of board feet actually cut, with better prices for better logs. Best of all, the cooperative members know how much they have for sale, in each grade of log, and are not helpless before the temptation of lump-sum cash. The members of the co-operative are making the most of last year's seed crop because their forester has been marking the lot so that only small openings, not too large to seed up this next spring, were left after logging.

Of course, like the gentle rain that falls on the just and the unjust, the golden rain of pine seeds has fallen on selectively cut, as well as stripped woodlots. But on the stripped lots, even if seed trees are near enough to the edge, the red maple, gray birch, and aspen may come in and shade out the young pines, whereas the shade of the pines left on the selectively cut lots should prevent some of these low value hardwoods from doing harm.

Most folks, when they are told of European forests, usually remark that of course the forests are outstanding because two trees were always planted for each one cut. Now this bumper crop of white pine seed is offering an opportunity to have perhaps, a hundred trees for each one blown down. Thrifty Yankee farmers have not been known to waste much that is provided by Nature. Will they make the most of 1941's golden rain of pine seeds?

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Moths And Memories

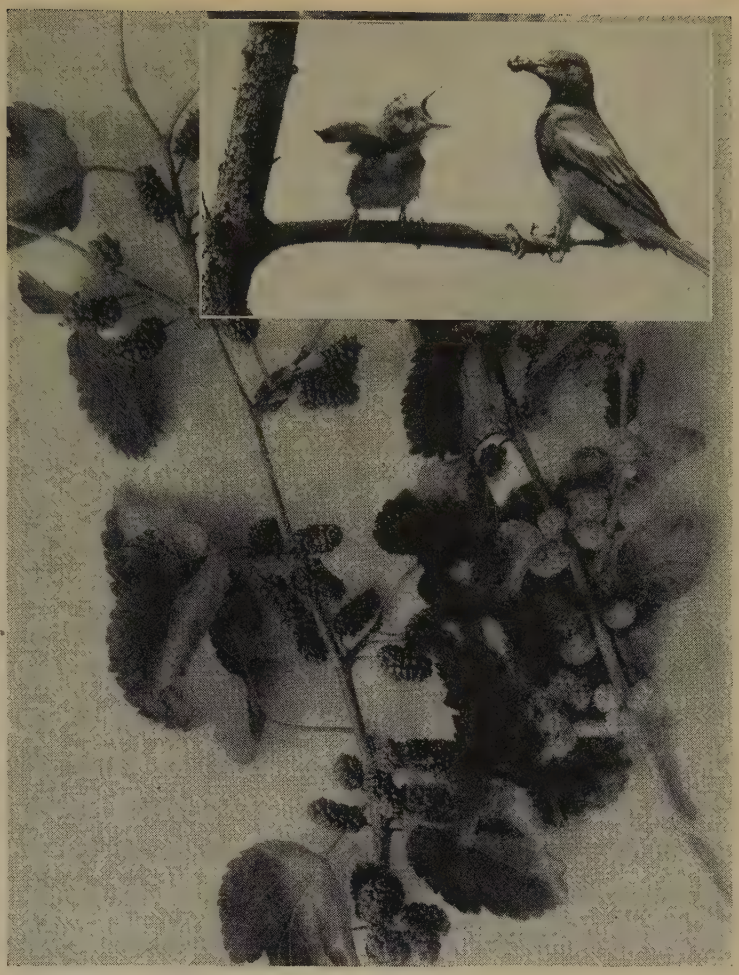
By MARGARET BUTCHER-COGHILL

I caught a little miller, but I guess he got away.
I put him in my pocket, and I kind of hoped he'd stay
Underneath my handkerchief until I came inside
And found a dose of something that would serve as cyanide.
His purplish wings were pretty, and I'd like them spread to view
For keeps, like other "lepidops" I used to catch with you,
Preserved upon a background which would tend to emphasize
The softness of this purplish blue that truly butterflies
Don't similate exactly, else they'd be the same as he.
And as it is now he's distinct from either ant or bee.
But since this one of which I write was smart and got away,
Now I must look for something else to commemorate this day.

The year around it is cheering to have—

Birds in Our Borders

By ANDREW S. WING
Garden Editor, Nature Magazine



MULBERRY IS A FAVORITE WITH THE BIRDS
Planted in one's yard, it will be popular as a source of food, as with the oriole shown in the inset

ALL THINGS come to him who waits—yes, even birds if he will trouble to invite them by offering a little hospitality. But merely hanging up a piece of suet and keeping the feeding stations full is not good enough if you want to increase your bird census.

True, you can attract a flock of sparrows, starlings, blue jays, and even a few of the choicer species merely by keeping free lunch available at all hours. But while a quarrelsome jay, or even a chattering English sparrow, may be better than no bird life on a dismal March day, most bird lovers are not satisfied with that. To have birds about the year around, especially the rarer and finer species, is a worthy ideal not difficult of attainment if one will go to a little trouble in planting the home acre. Indeed good gardening and bird attraction go together, or can easily be adjusted to one another with little extra trouble and almost no expense.

You can plant your grounds according to the best principles of informal landscape design and make the birds love it. Indeed, in only one major aspect is good gardening inconsistent with bird attraction—insect control. Many species of birds are insect eaters, and if spraying is done too thoroughly the bird population may suffer. Not that the spraying itself harms the birds, or even the probability that the poisoned insects that they eat will injure them. Birds are quite tolerant to poison although we believe that this question should be thoroughly investigated. But if you do kill off all the bugs the birds will go elsewhere to feed. However, there are few gardens where the spraying is so thorough as to destroy every insect on all the trees, shrubs and plants on the place. If your conscience will permit, a gnarled old apple tree in a back corner, even though it is sprayed once or twice a season, will prove a haven for a number of our more attractive bird species.

It may be more desirable to have the birds around than to harvest a few worm-free apples. I say "may" advisedly, realizing that for a garden editor to suggest such a thing is rank heresy. However, it is your own conscience that must be listened to, and I have seen some fairly good apples come off an old Russet tree that had neither been sprayed nor pruned for more years than any one could recall. These old trees were riddled with worm holes and were practically a cafeteria for several species of birds the whole year through. Spraying the trees when in bloom, or later after the apples had formed, would probably not have reduced the insect population of the trunk and branches unduly, but no doubt would have discouraged birds which feed on leaf-eating and fruit-infesting insects.

But the most important aspect of gardening for the birds is the positive one of planting trees and shrubs, notably the latter, which provide good shelter for birds and at the same time offer them a supply of food in the form of fruits and berries. Protection from cats and other marauding mammals is a basic necessity in bird attraction. A hedge of thorny material such as Japanese barberry or hawthorn, or some prickly evergreen such as red cedar or one of the other junipers, is invariably inviting to birds that like to nest or hide fairly near the ground. Catbirds, thrushes and a number of the wild sparrows invariably find safe havens in plantings of this nature.

Some authorities assert that thorny bushes or trees are even better than the prickly ones such as the barberries. As to that I am not in a position to judge, but I do know that as soon as the Japanese barberries in our yard grew large enough to provide protection from marauders, the bird

population picked up noticeably. At the same time, of course, red cedars, hawthorns, and other shrubs and small trees were growing up to a size which gave a good many sheltered spots in which birds could nest and hide.

Because of its rugged character, its impenetrable interior (except for birds), its abundant supply of bright red, edible berries, and its general usefulness and attractiveness as a shrub and a hedge plant, I therefore rank Japanese barberry close to the top. This in spite of the fact that it is common, even to the extent of naturalizing itself in woods and fields, and for that reason rather scorned by gardeners who feel that there are hedge plants more deserving of recognition.

Their point is well taken, but we are now considering bird gardens and I cannot erase from my mind memories of ring-necked pheasants stealing along over a deep snow, picking red fruits from our Japanese barberry hedge; or the catbirds and wood thrushes that nested there. The fruits of the barberry are not so attractive to birds as are some others, but they are very welcome nonetheless in late winter or at any time when other food is scarce. But the barberries are a large family and there is no reason why they should not be planted in variety, especially some of the newer evergreen forms.

Those who wish to make a careful study of plantings for birds should consult the leaflet "Song Bird Sanctuaries" published by the National Audubon Society. This leaflet contains a comprehensive list of trees, shrubs and vines that offer shelter and food to birds. So long is this list of native and exotic material that it offers much to choose from to suit the individual taste or requirements for landscape planting.

From this leaflet and other literature one learns of the possibilities of increasing bird life by scientific planting. When the Audubon Society first took over the Roosevelt Bird Sanctuary at Oyster Bay, Long Island, there were only a few individuals of fourteen species of birds nesting there. The total of nesting species is now thirty-six, and the number of species that have been observed is 140. It is stated that similar results can be obtained anywhere in the eastern United States. This was done not so much by extensive plantings as by a systematic clearing out of trees and rearrangement of shrubbery plant material already there. One of the essentials is to create as natural an effect as possible by leaving some leaves, dead wood and branches around, and even a few brush piles. On a small place such as an ordinary city or suburban lot this is not so easy to do. However, it is possible to have a few bushy, shady corners where birds can feel at home.

AMERICAN HOLLY ATTRACTS BIRDS

Cedar waxwings are among the birds enjoying the berries. A family of waxwings appear in the inset

As this is written I look out into a porch where there are several bird feeding trays and hanging suet holders made of limbs of trees with holes bored in them. The birds come and go all day long, mostly chickadees, as I keep food in other parts of the garden for the larger birds such as jays and pheasants. I notice that seldom do two birds feed together amicably, and moreover they arrive singly, nearly always stopping in a nearby planting of Canadian hemlock or yews before alighting on the porch. These evergreens serve further as a windbreak and shelter during rain and snowstorms. The importance of having evergreens around for winter protection as well as beauty cannot be overempha-

BARBERRY PROVIDES BERRIES AND SAFETY

As a hedge it shelters some birds, such as the catbird shown in the inset, and also supplies them food

sized. They are useful at all seasons.

There is another very important reason for including evergreens in your bird garden. Certain birds obtain feed from the cones of hemlock, Norway spruce, Austrian and white pine, to name but a few. The berries of our native American holly make good bird food, while those of the other hollies are fair to good. The red berries of the black alder, and the buds of apple and poplar, are loved by grouse.

It is important to consider the seasons in providing food for birds by trees and shrubs. Certain fruits and berries are good only for a short time after ripening in summer. Shadbush and scarlet elder are in this group. If you want to distract birds from cherries and other fruits, plant mulberry trees or scarlet elders—an even better way than to try to frighten them off by scarecrows or bells in the trees.

As autumn rolls around there is an abundance of tree fruits and berries for the birds to choose from. Among the best of these are the dogwoods, the white flowering dogwood being very prolific, although the shrubby dogwoods are also worth while. The Siberian crab will have an abundance of decorative fruit for fall bird dinners, and the flowering crab carries its little apples into winter and is beloved by mockingbirds. Some of the birches make good food for late winter, particularly the yellow birch, which finches like, while the common gray birch is attractive to birds because of both insects and seeds. There are many factors to consider in providing a home-grown food supply for feathered visitors. The greater the variety of berries, fruits, cones and seeds, the better the opportunity to serve and attract a large number of species both as migratory visitors and as seasonal or permanent residents. Supplement the natural food with suet and boxes or trays of bird seed of assorted sizes and your bird callers will be much more likely to become regular boarders.

If you will grow some berries or bush fruits, the birds will take their share of these—perhaps the lion's share of strawberries or cherries unless other tree or bush fruits are planted to divert their attention. While such things as dwarf sunflowers, cosmos, marigolds and other flowers that bear seeds liked by birds cannot be classified under the heading of permanent plantings, they are decidedly worth having if only to lure such delightful migrants as the goldfinches into staying for a few days.

If one has a place for a bit of wild garden, plant some wintergreen (checkerberry), and bunchberry for both beauty and bird feed. Many weed seeds are relished by birds, so if one has a vacant lot or a corner where grasses and weeds grow he can ease his conscience by thinking that it is an added attraction for the birds.

The feeding habits of birds make a fascinating study for the ordinary suburban or country dweller, even the city resident, if he has land around him. The noisy starling, which has become such a plague in certain cities, where public buildings are literally teeming with them every night, has its good points. For the starling is largely insectivorous and will feed on Japanese beetles and other grubs in lawns and fields, even when grain or other feed is accessible. It is well worth having a few starlings around just for this purpose, although we do not particularly relish its raucous voice and quarrelsome habits. A favorite feeding place for starlings is an apple tree where a few winter apples have been left on the tree. A friend tells me that the starlings in Washington feed in the outlying country during the day and fly (Continued on page 159)

World-wide and wicked is the teredo, the great—

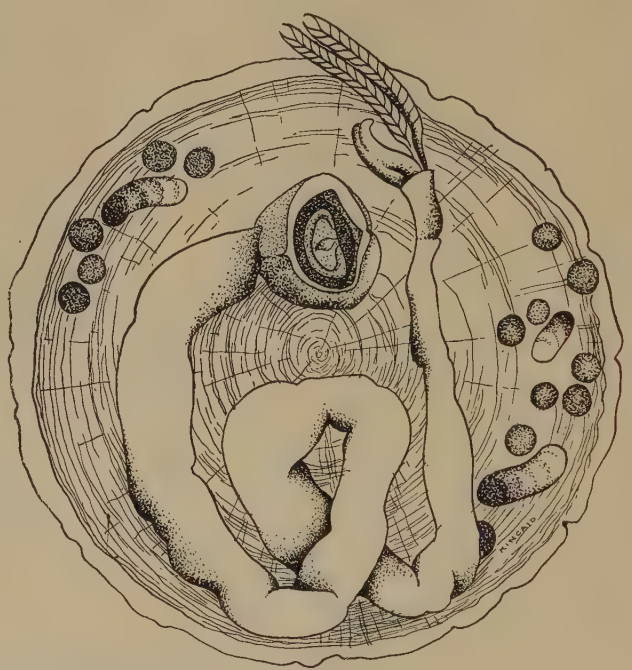
Animal Fifth Columnist

By MURIEL LEWIN GUBERLET

FIFTH COLUMNISTS are not the product only of the second world war, and they are not confined to the world of men. For thousands of years man has been trying to combat the stealthy, insidious practices of the shipworm, or teredo, as he is properly called. But in spite of warfare, propaganda, and the advances of science the lowly creature continues his evil way undaunted and unafraid.

Every wooden ship that has sailed the seven seas since the dawn of history has waged a battle with the shipworm. On the dugout canoe paddled by primitive man, and on the luxurious yacht piloted by a millionaire skipper, the shipworm has been an unwelcome passenger.

From the writings of the Greeks we learn that the slaves were ordered to keep a sharp look out for the first signs of destruction of the galleys. The Romans covered their boats with lead to protect them from the ravages of the shipworms. Pliny, the Elder, wrote, "What teeth nature has given the teredo. Even for perforating wood . . . and also she has made wood her principal nourishment." The ships of the explorers of the sixteenth century were often destroyed by this crafty fifth columnist. It is believed that the *Golden Hind* of Sir Francis Drake went to its watery grave through the subversive activities of the foes within its hull. Not until it was too late did the captain realize that he was sailing a ship made paper thin by an unseen enemy. So completely under cover are the activities of the shipworm that they are rarely discovered before destruction has been wrought.



WORM-LIKE BUT NOT A WORM
The teredo, or shipworm, develops siphons and a special mechanism to dig his destructive burrows

In every harbor, in every sea in the world, countless wooden ships disintegrate because of this artful chiseler. Proud, sturdy craft crumble and fall into disuse in much the same way that men suffering from cancerous growths weaken and die. The success of the shipworm's campaign against man lies in the fact that he has cohorts in the remotest outposts of the globe, and his world-wide organization is planned and mapped to the minutest detail. The far flung schemes of a Napoleon or a Hitler appear infantile and puny in comparison to the shipworm's stupendous world coverage.

The weapons and strategy used by the shipworm are strange indeed. His life story is as fantastic as a fairy tale, but unlike a fairy tale, which is a figment of the imagination, the shipworm leaves behind concrete evidences of his reality. The biblical quotation, "By their works ye shall know them", might well have been written about the teredo.

In spite of the name, and the naked worm-like body, the shipworm is not a worm. It is an unconventional member of the clam family. In the spring and early summer the shipworm, in common with many other animals, has the urge to reproduce himself. Promiscuously eggs and sperm are discharged into the water. If an egg has the luck to be fertilized, the tiny embryo is carried about in the water for a few weeks. However, when he is no larger than a grain of sand the young teredo tires of his nomadic life and swims toward the shore, where he rests on a piece of wood, preferably on the bottom of a wooden ship, or a wharf piling.

At once he begins to adapt himself to his new environment. He develops a hatchet-like foot on which he roams about looking for a suitable place to build a house. Having chosen a location, he covers himself with a thin layer of sawdust and awaits developments. Changes in his body take place rapidly. At one end a mouth, a more highly-specialized foot, and a tiny shell develop. At the other end two tubes or siphons, and a pair of feathery doors appear. The shipworm is now ready for the actual construction of his home.

Holding himself in place with his foot, the shipworm gets out his tools and begins to chisel. The sharp edges of the shell are his pick and shovel and he swings them back and forth with clock-like regularity eight to twelve times a minute. At each stroke of the shell valves a tiny

bit of wood is cut away and the foot takes a new hold, forcing the animal forward about half a millimeter. Working day and night for months the teredo builds an elaborate burrow extending a foot or more in length and half an inch in diameter. And as a result of the method of working the burrow becomes smooth and round.

As the shipworm gnaws himself deeper and deeper into the wood his body adjusts itself to its house by becoming long and worm-like. Once encased in the burrow the shipworm is a prisoner for life, being entirely cut off from the outside world except for the tiny opening on the surface through which he first penetrated the wood. This minute opening is tremendously important, however, because through it food is brought in, and waste is carried off. The siphons transport these materials in and out of the body. One of them brings in water containing microscopic food materials. The water circulates through the body and gives up the vitamins and oxygen to it. The waste water is expelled through the other siphon. If danger is near the siphons are instantly drawn into the burrow and the opening is quickly closed by a pair of feathery doors.

To supplement the watery diet the shipworm eats some of the wood. Of course he cannot digest all the wood he saws off, so, in order to handle the waste, he has a kind of vacuum cleaner in which he uses his long body for the vacuum tube. In this way the bits of wood, as they are cut away by the shell, pass through the shipworm's body and are carried to the outside by the siphon. What a life! But a shipworm is willing to sacrifice his personal freedom for his subversive cause.

In the course of time hundreds of shipworms infest a ship and the hull becomes honeycombed with burrows extending in all directions. To avoid running into one another the burrows twist and turn in a most intricate fashion. Without rest and without protest the shipworms work on, for they know that eventually they will undermine the structure of the boat and thus achieve their end.

The only hope of overcoming the machinations of this intrepid fifth columnist is to construct ships of iron and steel, substances which, in combat with our fellow men as well as with teredos, appear to be the best safeguards against the encroachments of the aggressive enemy powers.

Seaweed Fertilizer

By J. D. U. WARD

In England seaweed is a favorite fertilizer with potato-growers. This was so before the present war. Now there is a big fertility drive and "Dig for Victory" campaign to encourage the production of food at home. At the same time the supplies of imported potash have had to be drastically cut. The value of seaweed has, accordingly, increased, for seaweed has twice as much potash as farmyard manure. It also has half as much again of phosphoric acid and it is rich in mineral salts. Nitrogen content is nearly ten pounds per ton, and a relative deficiency in phosphates is easily made good by the addition of basic slag or superphosphates to make a valuable fertilizing agent.

Even before the war seaweed was being packed up narrow and steep cliff paths in the manner shown in the illustration. Only donkeys could negotiate the tortuous tracks; no wheeled vehicle could come up or down. It should be added, however, that this pack-donkey survival is not typical but is a curiosity. In most places seaweed was gathered with dung-carts from the foreshore.

Ten to twenty tons of seaweed to the acre is the usual allowance. In most places it is dug or ploughed in while wet, but if land is very heavy the seaweed is best allowed to dry and partially rot in heaps. In the evacuated Channel Islands, and on the Norman and Breton seaboards of France, there is an elaborate code of regulations governing the cutting, use and sale of seaweed as manure. Prices paid for seaweed used as fertilizer range, according to circumstances, from the equal of one to eight dollars per ton.

To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

Earth-Shine on the Moon

By ISABEL M. LEWIS

WHO HAS NOT at some time admired that beautiful phenomenon known as earth-shine, which faintly illuminates with dim radiance and outlines the dark side of the moon that is turned toward us at the crescent phase? Whether it is the waxing crescent visible in the western evening sky after sunset, or the waning crescent, which may be seen in the east before sunrise, the phenomenon and its cause are the same. The size of the crescent has little to do with the appearance of the earth-shine, which may be quite as brilliant when the crescent is three or four days old as it is when it is only a thin line of light. A too-bright twilight makes it less noticeable.

Earth-shine is to the night side of the moon what moonlight is to the night side of the earth. When the moon is in the crescent phase as viewed from the earth, the earth is nearly in the full phase as seen from the moon. Its reflecting surface is sixteen times that of the moon in area. Its surface is, then, almost fully illuminated by the sun's rays, as the moon is when it is gibbous just before or after full moon, and it reflects a flood of radiance to the night side of the moon. This is the earth-shine that we see dimly outlining the dark side of the moon when it is in the crescent phase before and after new moon. We who observe it must be, at the time, on the dark portion of the surface of the earth turned toward the moon, a portion small and crescent shaped and unilluminated; we are then, in other words, in the twilight, early evening, or early morning-before-sunrise side of the earth, else we would not be able to see the phenomenon.

Earth-shine varies greatly in brightness at different times. There are times when it is scarcely observable at all. Again it may be so conspicuous that even casual observers of the heavens wonder at it. There are a number of things that affect it. When the crescent moon is very thin it is less

conspicuous, as a rule, because the twilight is then so strong that its light is dimmed by it. When the moon is far south and its altitude low it is less easily observed; also when the air is ladened with dust and smoke as it is near large cities. There are, indeed, many times when earth-shine on the moon is scarcely visible at all because of poor observing conditions. Then, too, the brightness of earth-shine is affected by the nature of the earth's surface from which the light is reflected. Clouds, snow, great expanses of ocean, all reflect sunlight much more brilliantly than forests, great plains covered with verdure, or large desert tracts. The rotation of the earth on its axis brings, in turn, all these different types of reflecting surfaces under the rays of the sun, and storms and clouds all contribute their effects as well. So the brightness of earth-shine on the moon is to some extent dependent upon what part of our surface is turned toward it at the time, and what sort of weather we are having on our day side at the time.

There are to be two eclipses this month, one of the sun and one of the moon. The eclipse of the sun will be partial only, and its greatest magnitude will be only 64 per cent. It will touch scarcely any land except in the Antarctic regions, as the portion of the earth's surface that it covers lies in the South Pacific between New Zealand and South America south of the 20th parallel of south latitude and includes the south polar regions. It will occur on March 16 in Eastern Time.

The total eclipse of the moon that will occur on the evening of March 2, in Eastern Time, will be an exceptionally fine eclipse and it will occur at a time at which the total phase is easily visible in the eastern part of the United States. It will be visible, wholly or in part, over more than half of the world, including North and South America, Europe, Africa and most of Asia. The moon will enter the shadow of the earth at 5:31 P.M., Eastern Time, so that the moon will rise eclipsed in all parts of the United States. The total eclipse will begin at 6:33 P.M. and will last for one hour and thirty-seven minutes, ending at 8:10 P.M. The moon will leave the shadow of the earth at 9:12 P.M. These times are all Eastern Standard, and the corresponding times of the phases for any part of the country may be found by subtracting one hour for Central Time, two hours for Mountain Time, and so on. If these times be compared with that of sunset for different places given in standard time one can find for any place in the country how much, if any, of the total phase of the eclipse one may expect to see. At most places on the Pacific coast the total eclipse will end before the sun sets, and only the later phases of the eclipse will be visible. In the central states, generally, the moon will rise totally eclipsed, which will be a most interesting phenomenon to observe.

Even in eclipse the moon does not disappear completely from view but has an odd, coppery color. At some eclipses the moon is much brighter than at others when totally immersed in the earth's shadow. This depends upon the condition of the earth's atmosphere around the circumference of the earth where the sun is rising or setting at the time. The light that illuminates the moon's surface at the time of its total eclipse in the earth's shadow comes from sunlight, which shines through the ring of atmosphere surrounding the night side of the earth, which is turned fully toward the moon at the time. Sunlight passing through the atmosphere is bent into the shadow of the earth and furnishes the illumination for the eclipsed moon.

Only in the eastern part of the United States will all of the 97 minutes of totality be available to observers. Here the moon will rise eclipsed shortly before the beginning of the total phase. The eclipse will be observable under more favorable conditions, with the moon high in the sky at time of its total eclipse, in Europe, Africa and in western Asia.

The planet Mars is an interesting object to observe this month because it gives us such an excellent illustration of the difference between a star and a planet. As we know, the stars appear fixed in position relative to one another, at least during long periods of time, but the planets change their positions more or less rapidly with respect to the stars. This is particularly noticeable this month in the case of the ruddy planet, which is now moving rapidly through the constellation of Taurus and, at the same time, rapidly decreasing in brightness as it recedes from the earth. At the beginning of March Mars is almost exactly equal in brightness to Aldebaran, which lies near it in Taurus and also resembles it strongly in color. On March 1 Mars is a considerable distance northwest of Aldebaran, but during the month it passes it, and by April 1 will be found some distance to the northeast of it. During this time also there is a very decided drop in its brightness, and by the end of March it is noticeably inferior to Aldebaran in brightness. It will also be interesting to note another difference between star and planet, the steadiness of the light of Mars and the twinkling of the light of Aldebaran.

Mercury will be at its greatest apparent distance west of the sun in the morning sky on March 7, but one must have a clear view to the southeastern horizon to pick it up around that time. It will rise only about an hour ahead of the sun.

Venus is now very brilliant in the morning sky. It will be at maximum brilliancy on the morning of March 9. It rises at this time about two hours before the sun, and is so brilliant one should be able to pick it up in broad daylight.

Jupiter is a magnificent object in the evening sky in Taurus. At the beginning of the month Mars, also in Taurus, is some distance west of Jupiter, but rapidly lessens the distance between them until, by the end of March, it has nearly caught up with the giant planet. Both planets move from west to east during the month but Mars much more rapidly than Jupiter.

Saturn is now in the western evening sky in Taurus a little to the southwest of Mars at the beginning of March. This is the last month that it will be seen in the evening sky to advantage for some time as it will soon draw in toward the sun and then pass to the morning sky. The rings of Saturn are now in fine position for observation in the telescope.

The sun will be at the vernal equinox at 1:11 A.M. on March 21, E.S.T., and spring will then begin in the northern hemisphere and autumn will start in the southern.

Orphans Two

By MAUDE GAHAN HOMAN

"Leo had two little deer
Their gray coats flecked with
snow,
And everywhere that Leo went
The deer were sure to go."

When Leo Gordon of San Fernando, California, swung into the Fiesta Day parade, he was flanked on either side by Tom, the buck, and Jerry, the doe, two orphan deer he had rescued from coyotes, while returning from his mine in the High Sierras.

The coyotes had fatally wounded the mother and were just about to make off with her new-born young, when Mr. Gordon came on the scene. He finally beat them off with stones and a heavy club, gathered the helpless fawns in his arms, placed them in his automobile that stood on a nearby road, and drove home.

With Mrs. Gordon's help the fawns were fed warm milk from a baby bottle. Under this tender care they thrived and became the pets and playmates of the then two small children of the family.

When the deer grew big and strong, Mr. Gordon was confronted with the problem of taking them back into the mountains. Deer are protected on National Park lands, and, except during the hunting season, elsewhere, and there is a penalty for removing them. The young Gordons made such a row at the prospect of losing their playmates, however, that in desperation Mr. Gordon went to the Federal agent in Los Angeles, told his story and was given a permanent permit to keep them.

"They are like two spoiled children—the deer, I mean," says Mr. Gordon. "Sometimes when I lay down to rest on an old couch on the screened porch Jerry would nuzzle me over so she could lie down beside me. If the children forgot and left the back screen door unlocked, the two of them, smelling the dinner, would come bounding into the house and sniff around the table. On one or two occasions, when no one was in the room, they made off with most of our dinner."

Tom and Jerry have grown up with the Gordon children. Now that Leo, Jr., and Anna are too big to romp with them any more, the deer roam around at will. The yard is not fenced in and sometimes Tom and Jerry will saunter off into the nearby mountains. In all the nine years Gordon has had them, they have never failed to come bounding home again. Which again proves that kindness and understanding is appreciated by wild animals. Also, they have been lucky in avoiding the gun during hunting season.

A FEATURE OF THE FIESTA DAY PARADE

Leo Gordon leads his pet deer. Above, the two fawns soon after they had been rescued from coyotes that killed the mother

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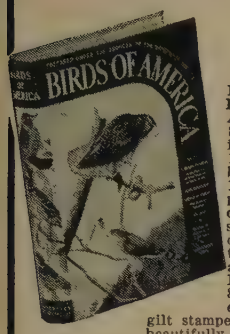

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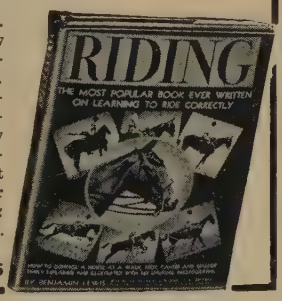

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BIRDS IN OUR BORDERS

(Continued from page 153)

in by the thousands to roost under the sheltering cornices of the old Treasury Building and some of the more modern federal buildings. They have practically displaced the sparrows, whose feeding habits are better suited to horse-and-buggy days.

The balance of Nature, so important in the relation of plants, animals, insects and man, is dependent on the existence of birds. We can help ourselves materially in the maintenance of our home grounds, in our vegetable and flower gardens, and on our farms, by encouraging birds to stay with us. As I gaze out the window across the snow my eye catches the movement of birds in the hemlocks. One by one they fly to the food trays on the porch and then disappear into the evergreens or into a nearby woodlot. From the river comes the quack of ducks, which now stay with us all the year. The beauty of living in the country is greatly enhanced by the ever increasing presence of birds, and knowing that we have encouraged them to stay adds much to the pleasure of having them with us.

NOTE: Some of the available literature on bird attraction follows:

Song Bird Sanctuaries. The National Association of Audubon Societies, 1006 Fifth Avenue, New York. 25 cents.

Audubon Catalog. Contains list of books, pamphlets, prints, etc. Free.

Producing Wildlife by Good Farm Land Use. Michigan State College, East Lansing, Michigan. Free.

How to Attract Birds in Northeastern United States. U. S. Dept. of Agr., Bul. No. 621.

Printed or mimeographed leaflets (many free) on methods of attracting birds, including lists of fruit-bearing shrubs for various reasons, may be obtained from the Fish and Wildlife Service, Dept. of Interior, Washington, D. C.

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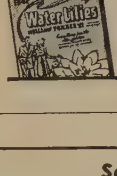

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THE SCHOOL PAGE ★★★

EDITED BY DR. E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

Do You Know Enough to Stay Out in the Rain?

Possibly, you may have reread the title of this article thinking it must be a misprint. Certainly, the idea is contrary to what most of us hear about the intelligence of those who do stay out in the wet. But the title is not a misprint, and the idea is not a facetious one. On the contrary, it is intensely serious. We may find again that the intelligence testers have missed a point if they brand as morons those who persist in staying out in the rain. We, who may have learned how to stay out in the rain—and to like it—may even be called upon to save those who judge us from the consequences of their short-sighted philosophy.

One reason why it is intelligent to stay out in the rain is that you can thus see and hear many things that cannot be seen or heard at other times. Most of us learn in large measure through what we see and hear. The world is in the making during a rain storm. Earth is being eroded. Streams are becoming clogged and are changing their courses. Landslides take place, and living things are being either drowned or brought back to life. Animals walking here and there leave tracks that may be seen much more easily than can those that are most commonly made in dry weather.

The child who is interested in water rushing down the gutter should not be reprimanded—providing he has managed to keep dry—but should be encouraged to study what that moving water can do. Dams of slush and dirt in roadside ditches provide cheap laboratory equipment for many practical lessons in the general science field. Also, they may provide reasonably safe analogies to illustrate what is happening or has happened on a larger scale, to provide subject matter for the teachers of physiography and historical geography. It is much more fun to see a delta, a consequent stream and a gorge in the making, than to try to figure out how one might have been formed some thousands of years ago. We make much of the movies that shorten the time spent in the development of a plant, but ignore equally interesting examples of physical geography in miniature because someone tells us that it is not intelligent to stay out in the rain.

Animal behavior associated with the rain is well worth watching. A picture of a salamander in a book, and the look of repugnance on the face of a "perfect lady" school teacher when she talks of the "slimy things", has nothing whatever to do with the experience of wandering in the rain through wet woods when the red efts walk the forest trails. I do not know whether I like the form found on the west coast better than the one found on the east coast, but I do know that I like the free rainy weather beasties much better than anything any teacher ever told me about them indoors, or than anything I ever read about them in the dry pages of a book. If you do not know enough to stay out in the rain, you do not know the thrill of working with red efts in their natural haunts.

What goes for the red efts goes for many another amphibian. Notice, this spring, how differently many frogs and toads behave when the rains start up. If you drive at night, notice how many more frogs and toads go leaping across the highway when it rains than when it is dry. This experience alone should be enough to show you that you must be missing something if you do not know enough to stay out in the rain. If you do stay out, do not be afraid to get down on your knees on the ground and see what is going on there. The wet plants may have many more small animals crawling over them than is the case when the weather is dry. It is during such times that many of the "horsehair snakes", which are really parasitic worms, make their way from insect hosts to the waterway where they may lay their thousands of eggs. It is much easier to find these worms free of their hosts if you are out when it is raining than if you are the conventional stay-at-home.

If you wish to seem a little more crazy to your friends than otherwise, then, in addition to staying out in the rain, try staying out in the rain at night. Your friends will be the losers by not joining in such an experience. If you use a flashlight, you will, of course, find your lawn well populated with mating earthworms. If you search among the plants, you will find how many of the insects that hop about in the sunshine manage to find a relatively dry place to serve as shelter in the night.

It will, in fact, surprise you how many relatively dry places the smaller animals are able to find outdoors during a rainstorm. The inside of some flowers, holes in the trunks of trees, overhanging stones, fallen logs, loose-hanging bark, underground burrows—all offer shelter to those small animals that, unlike us, are unable to cover their bodies with rain-repelling clothing. The time to make such an interesting study is when it is really raining, and when you can see for yourself what is happening to these animal recluses.

Plants in the rain are just as interesting to observe as are the animals. Some expand their parts and take in the falling water. Others seem to contract and shed the downpour. The bell-shaped flowers, which are so common in our spring woods, may contain relatively dry and almost dusty pollen, even though it is raining outside. Many plants, like the liverworts and mosses, must depend on moisture to effect the true sexual union of their eggs and sperms. While we cannot witness this event with our naked eyes, we can at least notice how the appearance of these plants changes as the wet spring months give way to the drier seasons that follow.

The sounds to be heard during a spring field trip in the rain are, to many of us, the finest Nature has ever produced. I once wrote that I knew of nothing I liked better than to hear a white-throated sparrow singing in the rain. I remember the very tree where I first saw such a bird in such a performance. George Dorland, a New York City school principal, read my comment and sent me a verse he had written about the joy he also got listening to this bird in the rain. One verse of Dorland's poem I never had to learn, since it was such a perfect description. He wrote:

"Take some April mornin', never mind the showers,
Git up aroun' sunrise time; look fer early flowers.
Listen!—'Ol' Sam Peabody-y-y-y' jest ez plain ez plain—
Bless his heart!—a white-throat, singin' in the rain."

This is the sort of thrill that none can really get unless they know enough to stay out in the rain. It is the sort of thrill that, once experienced, you want to share with every one else. It is the sort of thrill shared by field naturalists that brings them together in a common bond. Such a bond can never be broken by the ridicule of conventional stay-at-homes whose greatest fear is that they may actually get their feet wet, and who depend upon "book-larnin' " because it is easier and can be attained even while one is safely tucked in bed.

Many of those who may read this page may be compelled, as soldiers or as sailors, to spend long hours in the rain. Others may be forced by emergencies, which so far have not become realities in continental United States, to live outside of permanent shelters for some hours. If these hours are not used wisely, many inexperienced persons may become so thoroughly soaked that they may contract serious illnesses. These hours may be the most important of all in the lives of many, and leadership should be provided to help meet any emergency that may arise in which many people may suddenly be called upon to stay some hours out in the rain whether they like it or not. This calls for a wider understanding of the practices of camping and a recognition by the school authorities of the educative values associated with the real experiences offered by outdoor life.

We advocate the improvement of health in our children, and erect great musty gymnasiums where these juveniles and their parents may go through unnatural exercises in a stuffy air on dirty mats. Some of our so-called outdoor sportsmen go on fishing and hunting expeditions dressed "fit to kill", but not outfitted with the knowledge of how to build a fire in the rain or throw together a tree-top shelter. This is all wrong. We spend billions prodigally for the construction of essential and expensive machines of war, but almost nothing for the training of the men and boys who may be forced in the front lines to match their wits and skill with other soldiers able to live off the land on almost nothing. We need a new deal so far as our interest in living the life of the pioneer is concerned, and this interest should be general for all of us, old and young. Already, there are some states where school camps have been developed, but unfortunately many of these think it necessary to house their campers in palatial rustic shelters with running hot and cold water within the reach of all. This will not solve the problem. Rather, it may complicate it by making people soft rather than by making them rugged. You cannot rough it in the

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Possibly, it will be best if most of us begin this interest in living close to Nature during the months with the milder weather, but it should be continued as the weather gets more severe. Really, there is more comfort sleeping in a snowbank than there is sleeping where the mosquitoes are bad, but the problem of keeping warm and dry is a little different. One thing is certain and that is that the problems of living outdoors will be real and not academic and the resultant education associated with solving those problems will be genuine and not shoddy. If you, as a reader of this page, are interested in education in any sense, it may be worth your while to think at least twice before you criticize adversely those who persist in staying out in the rain. Do you know enough to stay out in the rain? If not, why do you not begin to learn to do so before circumstances force you to cram such a course too quickly into your experience?

Audubon Nature Camp

On June 12 the seventh season of the Audubon Nature Camp for Adult Leaders will open with the first of five two-week sessions. The camp is located on a 330-acre island at the head of Muscongus Bay, about 65 miles northeast of Portland, Maine. It will attract teachers, youth leaders, camp counsellors and others from all over the United States. The camp operates at cost, and fifty campers can be accommodated at one time. For information write to Box 10, National Audubon Society, 1006 Fifth Avenue, New York City.

Yosemite Tour

The January, 1942, issue of *Yosemite Nature Notes,* publication of the Yosemite Natural History Association, Yosemite National Park, California, is devoted entirely to a self-guiding auto tour of the Valley. With this in hand the visitor by automobile —if he has the tires—will know where to go and what to see when he gets there. The booklet sells for ten cents.

Holes in the Ground

This is the title that E. Laurence Palmer gives to his November, 1941, issue of the Cornell Rural School Leaflet, an immensely valuable and extremely interesting number. It deals with the earth that we find above bedrock, and what holes in the ground mean to fertility and to soil.

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NATURE IN PRINT

As a convenience to readers the books reviewed in the pages of Nature Magazine may be ordered through the book department of the American Nature Association, 1214 16th St., Washington, D. C.

(Continued from page 119)

Among these are a high regard for the landscape and the world of Nature that is associated with the patriot's concept of his country. Those who have been eager to make an outdoorsman's contribution to the total war effort will thus find the pages of *Remaking America* suggestive and enheartening, not only because of the re-creative experiences so important to men and women waging a war but also because of the heightened sense of a land to be loved that has come with our national successes in conservation.

"We are beginning to realize," says Mr. Franklin, "that ours is a blessed heritage—forests like green cathedrals, rivers like life and death, sunsets which unfold like symphonies, streams which are happy and honest, mountain ranges which surge like the sea, prairies which hold a mystery, and deserts which answer all questions—this is the glory and the fullness of America. Those who have looked upon them are never quite the same."

The prospects for any enemy of a nation of such inspired citizens become increasingly perilous as these influences are the more widely and more deeply felt.

Names of Plants

Standardized Plant Names. J. Horace McFarland Company. Harrisburg, Pa. 1942. 675 pages. $10.50.

This book is a revised and enlarged listing of approved scientific and common names of plants and plant products in American commerce or use. It has been prepared for the American Joint Committee on Horticultural Nomenclature by its editorial committee, which consists of Harlan P. Kelsey and William A. Dayton. This is a much-needed book, bringing, as it does, order out of the considerable chaos of popular and scientific names of many of our garden plants. If the way charted in this book will be consistently followed by compilers of horticultural catalogs, and by writers on garden subjects, the public will be saved much confusion. It would seem that editors, also, have a responsibility.

Forestry Text

Seeding and Planting in the Practice of Forestry. By J. W. Toumey and C. F. Korstian. New York. John Wiley and Sons. 1942. 520 pages. Illustrated. $5.00.

This is the third edition of this manual for the guidance of forestry students, foresters, nurserymen, forest owners and farmers. It is a valuable, practical and up-to-the-minute text.

Fisherman's Manual

Fresh Water Fishing. By Myron E. Shoemaker. New York. Doubleday, Doran. 1942. 218 pages. Color plates of 18 fishes. $3.00.

The contents of this book are about evenly divided between information on the history and mechanics of angling and on the more important fresh water fishes to be found in the streams and lakes of North America. In his foreword the author says:

"Fishing is a diversion for the millions. Our natural resources supply the blood stream of our general welfare. Neither can survive without the close cooperation of the entire public. Future generations must have both, and they are entitled to a sound heritage.

"Now is the time to heed the warning of Izaak Walton and the others. Now is the time to educate every youth in America that fishing and all of the other activities of life cannot continue without conservation, conservation practices, and conservation minded people."

Tree Guide

Trees of the Eastern United States and Canada. By W. M. Harlow. New York. Whittlesey House. 1942. 288 pages. Illustrated in black and white and color. $2.75.

The title of this book is generally descriptive of its contents. It is a guide to the trees for the area indicated. In addition to the identification features, however, it includes with each species data on the woodcraft uses of the tree under consideration.

Broad-leaved Evergreens

Selection of Broad-leaved Evergreens. By L. C. Chadwick. Chicago. The American Nurseryman. 1942. 64 pages. 40 cents.

This is the third in a series of helpful booklets designed to aid people in the proper selection of ornamental trees for planting. The first two dealt with deciduous ornamentals and with narrow-leaved evergreens. The different shrubs and trees are treated by relative size and evaluated for their soil, climate and other requirements.

Nature Fiction

A True Brother. By Carl J. E. Nelson. Colorado Springs. Rays of Light Publishers. 1941. 248 pages. $1.50.

A fiction story written against a background of Nature and association with the outdoors, and with a philosophy of human kindness triumphant.

Living Outdoors

A new course of study has been added to the curriculum of the Rural Education Department at Cornell University. It is a course designed to train leaders in the art of living outdoors under all kinds of conditions and with the minimum of discomfort. It recognizes the dislocation of human lives by wartime conditions under which the bombing of cities and necessary evacuation may force people, at least temporarily, to maintain themselves under more or less primitive conditions. Map reading, the use of the compass, employment of native plants as food, weather prediction and similar aspects of outdoor living will be included.

Then Came Albinos

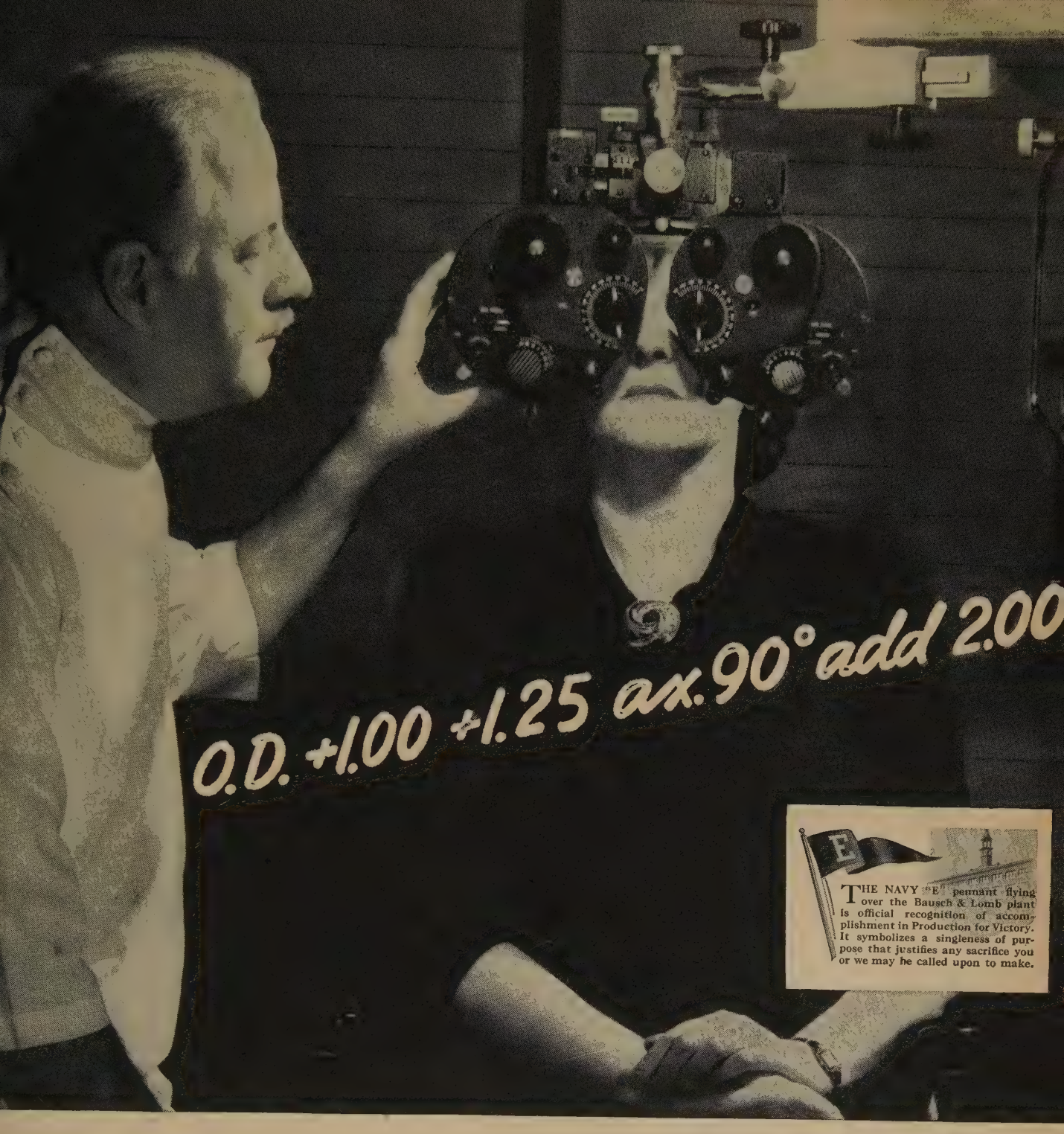
Many generations of squirrels have been reared in the large maple in the yard of Mrs. Elizabeth Haeussler of Minneapolis. And each generation has been the object of special solicitude by Mrs. Haeussler, who has tamed them and attempted to ease their way in the complications of city life. Last year, however, the squirrel parents treated their human friend to a real surprise when two pink-eyed albino offspring emerged from the nest. It took daily battling to keep little boys and dogs away from the conspicuous pair, and finally one of them disappeared, but not before Mrs. Haeussler had been able to get a photographic record of this variation from the usual in squirrel life.

Owl Record

In our January, 1942, issue we published some pictures and brief text about Richardson's owl, with a record of banding by a Toronto ornithologist who had been unable to find a record of an earlier banding. We are indebted to Harrison F. Lewis, chief federal migratory bird officer for Ontario and Quebec, for a record of banding on March 17, 1925, at Ottawa, Ontario. Although no date was given in our January story, it is apparent that Mr. Lewis' record was earlier. Can anyone better it?

Final Resting Place

In a last request memorandum written in 1933, the late Paul G. Redington requested that his mortal remains after cremation be sent to the Sierra National Forest in California, there to be interred on Shuteye Peak with an inscription "Paul Goodwin Redington, January 25, 1878 to January 12, 1942. 'Here he lies where he longed to be!'" This last request of a man who had served as a forester and as Chief of the United States Biological Survey has been carried out.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WOODROW MILLER'S TRAVELING BEES

(Continued from page 127)

are gassed and their combs stored. The following spring when the willows burst with pollen, these hard-hearted, but practical apiarists install in each of the empty hives two or three pounds of new bees and a queen freshly reared in California, Louisiana, or Texas, where certain beekeepers specialize in raising "package bees." The newcomers speedily establish themselves as a colony.

There were no native honeybees on this continent when Columbus discovered America—only bumblebees, wasps, and hornets. Orchardists need bees—ours are from several European strains—for pollinating their trees, a job the bumblebees once handled. But cultivation has destroyed many bumblebees' homes in holes in the ground. Insecticides, sprayed on crops to control pests, have wiped out good insects with the bad, bumblebees included. Now the honeybees have taken over the pollinating job in orchards, which yield considerable pollen but little honey. Along Miller's routes there are hundreds of orchardists who would gladly pay the migrating bee man a dollar a hive to let his bees work a fortnight or so among their apples, pears, plums, cherries, or other fruits —the crops of which are doubled or trebled by adequate pollinating. These extra dollars tempt some bee keepers, but not Woodrow Miller, whose sole interest is in holding his title as number one gleaner in the American honey harvest, which in 1941, totaled 180 million pounds. That was only one-fifth of the honey gathered by the country's bees. The other four-fifths the bees consumed in rearing more bees to glean still more honey. Woodrow Miller does not begrudge them this "bees' share." The big job, he says, is not getting the honey out of the hives; it is finding it and getting it into the hives.

JUST PLAIN SISSIES

By Eloise C. Miles

They're sissies, just plain sissies, with all their swaggering and bullying!

Sunday morning we opened our eyes to one of those fairylike sights that comes at least once in every winter. It had started to snow during the night, a fairly mild, windless one that brought a gentle, wet snow, and by morning every house and tree and fence was decorated with a smooth white coat and bonnet and made you "oh" and "ah" as you hurried to the window to look. And with that kind of a storm you did not mind fully enjoying it because you knew the "going" would not be hard for those who had to be out in it early—except for the birds.

We love to feed the birds in our neighborhood, and even though we live in a fairly large city, there are a number that come near the house even in the winter. So there is always plenty of bread, and cereal, and nuts, and sometimes suet, for them, and their friendliness and gratitude reward us a dozen times over for the little effort and expense we put into planning the collation.

What we find most fun while we are eating our breakfast near the window, are the bluejays that assemble each morning for the peanuts we put out on the ledge. Just let us forget them one morning, if we are a little late, and what a scolding we get—a loud, persistent and, we admit, rather unmusical scolding—until we put down our cup of steaming hot coffee and produce the peanuts. So we try never to fail them, well, just because we love to have them come to us, and depend on us.

That Sunday morning we very carefully cleared off a wide place on the window ledge and arrayed an extra goodly supply of peanuts. Then we started with our own breakfast. But no bluejays. We ate leisurely that morning because we could, and still no jays. So we finished and went on with our usual tasks, thinking perhaps we had never noticed before that they might sleep a little later Sunday mornings, too! But what we did notice was that all the other birds were up and about as usual. They almost seemed to be enjoying the snow, and certainly the bread and cereal we put out. The chickadees and nuthatches and woodpeckers were as busy as ever scurrying around over the bare branches and sending little showers of snow to the ground when they would stop to pry something out of the bark. And the starlings and sparrows and pigeons were equally busy zigzagging around after the bread crusts on the ground. But not a sign of a bluejay and all day long our large supply of peanuts stayed on the ledge, soggy, discouraged looking peanuts, and were still there when it grew dark and we lighted the lamp late in the afternoon.

Maybe that heavenly blue runs in wet weather, or perhaps they do not like to be seen in public with their perky crests wet and slicked down tight to their heads, but confidentially, we think they are sissies, afraid of a gentle, lovely snow storm—and we are going to tell them so tomorrow morning, if it is clear and they come shouting about for their breakfast!

ANT ENGINEERS

By Lehman Wendell

Some years ago I witnessed an example of ant cleverness so unusual that I was tempted to believe the old assertion that the ant stands next to man in point of intelligence. An enormous swarm of vile-smelling ants had invaded our basement late one fall. In my eagerness to get rid of them, and their odor, I hurriedly scooped them up and tossed them into the furnace, where they exploded like popcorn.

After I had swept up and cremated the swarm, I noticed that they had arrived through a square opening in the cement floor communicating with the water pipes below. The opening is filled with sand. Ants were still coming out of the sand, so I poured several bucketfuls of boiling water over it. It helped only momentarily, for new ants kept coming up. I went to the drug store, bought a can of white ant poison and sprinkled it on the sand.

Dinner was called and it was not until an hour later that I returned to the basement. Imagine my surprise when I discovered that the ants had performed an engineering feat, the like of which neither I nor any scientist, as far as I know, had ever seen before. The ants had decided to avoid the poison by building a highway across it. Each ant carried a clean grain of sand which it carefully laid down in front of already deposited grains of sand. When I arrived upon the scene, the highway was already about eight inches long and half an inch wide. It was as straight, and the two sides as uniformly wide, as if the highway had been laid out by a surveyor. The ants had encountered poison for the first time, yet they knew exactly what to do to avoid it.

Tree of the Little Hands

Dear Sir:

I am very much interested in the article on the tree of the little hands. We bought blossoms at the Toluca Fair, but there were never any leaves. After asking a great many people we finally located a tree on the outskirts of Mexico City, in a private yard. We were most courteously received and were shown the tree, which is like our elm tree, quite tall. The ground was all swept, so not a leaf could I either reach or find. I made a sketch at the time and am sending one to you. When they used an English name they always spoke of it as the "Tree of the Little Red Hand."

Excelsior, Minn.

Mrs. Perry Harrison.

SNOWFALL

By Dorothea Ostermeyer

It was so quiet. The other night it was different—the short, dry grass bristled in the wind; the dark, bare trees stood stiffly at attention; the brook shivered between the crackling rushes as it mumbled on its way.

The next morning—what could have been more beautiful? What more beautiful than to see a feathery blanket lain over everything in sight. Here and there some of the feathers had bunched on top of the milkweeds and goldenrod.

Slowly I began to feel at peace. The eager blood in my veins slowed to a steady pulsating rhythm, only to be quickened for a moment when my eye caught the blue flash of a jay flitting from branch to branch. Smiling inwardly, I thought, even the jay is quiet.

High—oh, so high up in the clear blue sky, a hawk played a lazy game of tag with little puffs of cloud, or so it seemed from where I stood.

As my thoughts came winging down to earth again, I saw, over under the pines, two little foxes romping in the snow. Grinning impishly, they scooped clouds of powder into each other's face with their beautiful tails. Suddenly they saw me. Putting their heads together, they decided upon a graceful but hasty retreat. Haughtily flaunting their brushes in my general direction, they scampered off in search of something new.

And so did I.

MIMOSA LODGE

By Ella W. Hard

This spring the eastern piazza has been my daily sitting room, and two little robins have been my most intimate friends.

Never, in all my eighty-six years, have I seen any birds' married life so intimately—from location hunting until the last soft grasses were lining the nest. Sometimes the two would come together; other times singly. Mrs. Red Breast, I thought, must be a second wife, or a very careless young housekeeper, for Robin did not seem pleased with her work. On his return to the nest he would carefully straighten some wisp of grass, or discard a weed-stalk that did not suit him. When everything was finished, Mrs. Red Breast laid three blue eggs. Robin seemed to take regular turns at the setting, and was more devoted than the little wife. On his return he would carefully turn over each egg before settling to his job. If he did not return as early as she thought he ought, she would perch on the edge of the nest, look carefully around in all directions, and give three staccato notes, pause a few minutes then call again. It was not singing, just an unmistakable call. In a few minutes back Robin would come, as hurried as a small boy who is late for dinner. Never was the nest in the mimosa tree left alone.

Once a jay came near, and out flew Robin, gave the accustomed call and attacked the intruder. Back flew Mrs. Red Breast, and such a fight ensued that the intruder retreated to a distance.

One Sunday morning the radio service was started a little late, and we enjoyed the sermon together, the birds coming and going as usual, but when the music began, things changed! One or the other gave the little *"chick! chick!"* showing they were disturbed, the same note they gave when the cat prowled around. I was interested but saw no reason for alarm. However, when the organ pealed as service was dismissed, the birds seemed terror-stricken. The next Sunday Mrs. Red Breast was attending to her duties when the first hymn was sung. Immediately she left the nest and called. After Robin's return, and the hymn was finished, they settled down to the regular routine and I listened with pleasure to the sermon. After a while they again had a shock as service was closed. Two or three Sundays proved to me they did not like religious music. This continued for several weeks.

In the meantime the eggs had hatched and we could see the tiny beaks above the edge of the nest. Two birds seemed stronger than the other one, and the parents always fed that one first, and gave it more food. What appetites they had! Both Robin and Mrs. Red Breast were kept on the constant move. They must be getting feathers now, I thought, and Robin looking forward to those first flying lessons, when he would dangle a most enticing worm just before their eyes, each time going a little farther off, and Mrs. Red Breast would fly under the fledgling to catch it if its strength should fail.

One late afternoon both Mrs. and Mr. were at home, and it was dusk before I stopped watching them. The next morning early the nurse told me that something was disturbing my birds, and when I came out about eleven o'clock Mrs. Robin was fluttering from limb to limb and giving the mournful little call. No little pink bills protruded from the nest. Mrs. Robin would fly to the piazza roof, then to the top limb of a big tree, then back to the mimosa and the empty nest. She never stopped this search and calling until about one o'clock. Then she went carefully over the whole tree, then over every foot of the lawn, even to the very edge of the piazza, then flew away. I never saw either of them again. Was it the family cat? Since the jays, which were frightened away by the couple and never came back, have since been constantly in the mimosa tree, perhaps they are the guilty ones. Maybe they killed poor Robin when away from home, then destroyed the family, when Mrs. Red Breast was alone and unable to protect her babies.

The bare nest in the mimosa tree makes me feel sad. Whenever I think of my bird friends, who enjoyed the sermons but did not like music, I wish I had them near me again.

Bird Sanctuary

Mrs. Rachel S. Wyckoff of Dallas, Pennsylvania, is ninety-three years young, and she attributes her youth to her sustaining and continued interest in her bird friends. Her home, where she lives with her daughter, Dr. Sarah D. Wyckoff, is a natural avian haven and a sanctuary, and the transient and resident birds are welcomed by plenty of trees and shrubs for nesting; by shrubs that provide food; by feeding trays and nesting boxes. Mrs. Wyckoff keeps a record of her bird guests and welcomes all bird lovers.

Flicker Habits

Ralph J. Rittersbach, Nature teacher of Wilkes-Barre, Pa., is convinced from his observations that flickers are becoming more domesticated, and find nesting and raising families in cities and towns much to their liking. He reports watching one pair of flickers start their nest site in an elm in the public square. They drilled a cavity about twenty feet from the ground, undaunted by a street car and bus terminal and encircling office buildings. The flickers raised their family, ignoring all this fuss, and were not even disturbed by a Salvation Army band that held open-air meetings under the elm four times a week.

December Sky Chart

We regret that the sky chart used in the December, 1941, issue of Nature Magazine was actually the chart for December, 1940, with the result that the planets appeared in the wrong position. The positions mentioned in the text were correct, and the rest of the chart was also correct.

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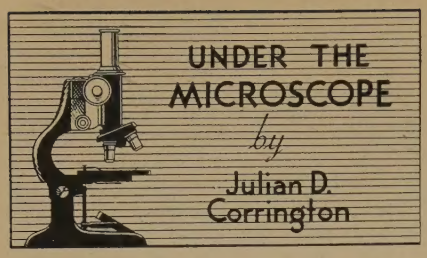


OBJECTS FOR POLARIZED LIGHT

The customary way of making observations through the microscope employs ordinary transmitted light, directing the rays upward through the stage aperture by means of a mirror. The object must be transparent, or at least translucent, and the use of a condenser is optional, depending on the type of objective employed and the purpose of the study. The method is termed bright-field microscopy and the light is polychromatic; that is, white light, as from the sun, or a reasonably close approximation to white light, as with artificial illuminants, consisting of a blend of all the colors of the spectrum (poly, many; chroma, color). With respect to vibrations of the rays, these take place in every plane at right angles to the direction of propagation of the light waves, and such light is called ordinary or unpolarized.

This has been the time-honored method of microscopical study and has yielded the vast bulk of the information about microscopic organisms or structure. The last two hundred years, however, have added many items to our knowledge of light and its behavior under different circumstances, and have witnessed the invention of accessories enabling the microscopist to employ various kinds of light in his studies. These have, indeed, "thrown much light" on all of the many classes of objects investigated and have added greatly to images first gained through bright-field work.

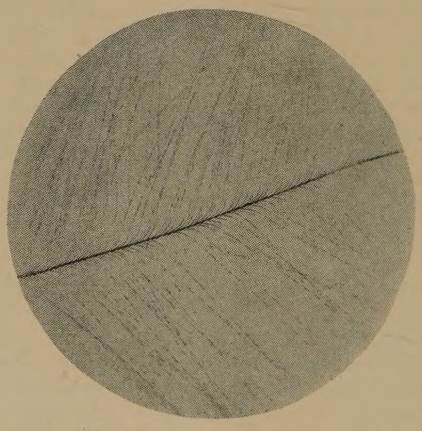
Monochromatic (one-color) light is such a variation in usual procedure. Here one or more filters are used to screen out all of the wave lengths of white light save those of a single color; or at least a single color will predominate. The light source itself may produce a light consisting of fewer than the total number of prismatic colors, and thus make the filtering task more easily and precisely done. The greenish-blue light of the mercury vapor arc is an example, and with this as a starter, we may screen out practically all of the visible light and obtain the large proportion of invisible ultra-violet present in rays from this lamp, or we may filter out most of the ultra-violet and the blue and secure a bright green.

Monochromatic lights, be they blues, greens, yellows or reds, are not suitable for visual use as they are very trying on the eyes. But inasmuch as they can be brought to an exact focus, since much more uniform as to wave length than white light, they are generally superior for photomicrography. The advanced worker in this field almost always uses light filters. Furthermore, he may take photographs by means of ultra-violet and infra-red, ranges of light not perceivable by the human eye, and such pictures often present additional or finer detail, increasing knowledge of the subject.

Dark-field microscopy, Rheinberg discs, the electron microscope, oblique and vertical illumination, and polarized light—all of these methods have likewise broadened the horizon. By way of review for those readers who have not followed this department since its inception, we list here previous installments having a bearing on this subject in general and polarized light in particular. Elementary photomicrography was discussed in the issue of January, 1938; the nature and work of lenses in March, 1938; principles of magnification in April, 1938; illuminants for the microscope, January, 1939; the RCA electron microscope, February, 1941; while the nature of polarized light, how it is obtained by either Nicol prisms or Polaroids, and how it is employed in microscopical studies, were explained in detail and with numerous illustrations in the issue of November, 1940. In future chapters we plan to take up some of the other appliances and methods not already considered.

The invention of polaroids has placed the use of this peculiar method of illumination within the reach of everyone, and even the simplest of amateur microscopes may now be equipped to provide polarized light of a quality satisfactory for all ordinary observations. Expensive professional models of petrographic microscopes, as used by the geologist and chemist, have built-in Nicols and numerous accessory devices, but a simple substage polarizer and eyepiece analyzer of polaroid material will suffice for general studies.

Having such an outfit, however, the average amateur is often at a loss as to what to do with it, and has no idea of the wide range of objects that will react to this light. So, too, the teacher, or even the research expert in biology, especially if his field of major interest lies in entirely different lines, has probably never seen commonly observed objects under polarized light and has never thought of demonstrating the phenomenon to his classes. With a set of polaroids this is easily and quickly accomplished, without tedious or uncertain adjustments, using any laboratory microscope, with or without a condenser, and with startling and definite results. The industrial microscopist is much more familiar with the subject since, in most instances, he probably employs polarized light as a matter of routine.



DOWN FEATHER OF WHITE LEGHORN PHOTOGRAPHED WITH REGULAR ILLUMINATION (ABOVE), AND WITH POLARIZED LIGHT

A complete listing of all optically active substances, suitable for use with this light, would be impossible. The following suggestions, however, may prove stimulating or helpful:

Cellulose polarizes strongly, as also the closely-related starches and certain plant crystals. Mount a small piece of ordinary transparent cellophane on the microscope stage and observe first in the usual manner; then add the polarizing accessories and study with uncrossed and then crossed elements. Move the sheet of material around to find the most favorable places. If you have never seen the beautiful colors produced by this simple, colorless object, you are in for a surprise and a treat.

In similar fashion, examine small pieces of various rayons, and both the fabrics, threads, and individual fibers of cotton and linen. Starch grains behave similarly, and preferred species for this use include potato and *tous-les-mois*, the latter from the root-stock of the edible canna. Inulin crystals, as seen in sections of roots and rhizomes from many plants, as dandelion, sunflower, and Canterbury bell, glow with prismatic loveliness. Try such slides as are available of cross sections of plant stems; often the thick-walled vessels will shine while other structures remain dark. Epidermal hairs from such leaves as deutzia and alyssum are favorable subjects.

Another organic material that is very active optically is keratin, a substance forming the chemical basis of epidermal tissues in a wide variety of animal types. Hair, horn and nail are examples. Whole mounts of hairs, feathers, scutes and fingernail cuttings will polarize brilliantly, while sections of the scalp, either horizontal or vertical, make admirable histological demonstrations. One of our favorite slides for use with polarized light is a routine horizontal section of human scalp, stained with hematoxylin and eosin, the hair shafts seen in cross section lying within their follicles. An unstained mount of this same tissue, especially for use with polaroids, is easily prepared if one has a block held in reserve for future additional stained sections. Similarly, a horizontal section of bird skin, with the feather shafts in cross section, is a splendid preparation for the purpose. Sections of whalebone and hoof are notable.

Allied to keratin are chitin and silk and similar invertebrate products. A silken cocoon, silk fibers, sectioned insects, whole mounts of snail radulas, wing scales, and the anchors and plates of Synapta in either whole mount or section make excellent objects.

Bone is another substance that polarizes well. Sections of dry ground bone or tooth should be shown under polarized light when studying these subjects in histology. Sections or whole mounts of the skin of various fishes, as shark and eel, have long been favorites, while whole mounts of larger, individual fish scales polarize well. Still an-

other histological subject is striated muscle.

Turning to inorganic objects, chemical and mineral crystals constitute a very important class, for it is by means of polarized light that many of these are identified. Both thin sections and isolated crystals or pulverized material containing crystals may be studied. Microscopic gem cuttings floating in fluid will scintillate with the utmost brilliance; powdered talc, crushed granite, and an endless list of similar materials will provide many hours of instruction or entertainment. Selenites are favorites.

Most spectacular among chemical subjects are the fatty acids, such as palmitic or margaric, solid at room temperatures. A slide is made by warming the acid until fluid, placing one or two drops on a slide and sealing on a cover glass with any cement. To use, warm gently until the acid melts, then mount on a microscope stage and observe crystallization during cooling. The gorgeous forms and colors assumed under polarized light make marvelous subjects for projection at close range, or for Kodachrome, still, or motion photomicrographs.

Polarized light is used to detect strain and imperfections in glass. Some search about your premises will probably turn up broken pieces of window glass, saved for one purpose or another, and if you will pass some of these across the stage of the microscope with the polaroids crossed you will note examples of this detective function.

HISTORICAL OUTLINE

Third of the great triumvirate of pioneer microscopists was Marcello Malpighi (1628-1694), born at Crevalcuore, near Bologna, Italy. Rated among the world's foremost scientists in his own day—a most unusual accomplishment—the passage of some three hundred years has not dimmed his fame. Today one may still read his many works with profit; his portrait hangs in the rooms of the Royal Society of London; and his monument is one of the more important shrines of Bologna.

Four years the senior of Leeuwenhoek and nine of Swammerdam, his life span of sixty-seven years ended between those of the two great Hollanders. The eldest son of farmers of independent means, he received a good education in literature and philosophy, then suddenly found himself orphaned at twenty-one, with seven younger children in his charge. At twenty-five he had taken his degree in medicine from the University of Bologna, and three years later, as professor of medicine at this institution, he began a notable career as a teacher, investigator, and practicing physician. Twice he was called to other positions, at Pisa and at Messina, but each time returned to his alma mater. All of his adult life he was pursued by members of another family who had quarreled with his father over the location of boundary lines between their adjoining properties. These people did their best to vilify Malpighi personally and professionally, but while they frequently made life miserable for him, they could not undermine the upright character or scientific accomplishments which he patiently erected.

His portrait, as well as the writings of his biographers, attest a man of refinement and scholarly character. He worked diligently and with sustained interest, and even under persecution from his enemies always remained even-tempered and dignified where many another man would have become embittered by the patent injustice of the attacks. He was modest, never assertive, and led a quiet and exemplary home life with his devoted and helpful wife, Francesca. They had no children.

Malpighi is generally considered as the first exponent of modern scientific research. For forty years he labored continuously at a wide variety of subjects, leaving the mark of an important pioneer in each field. He invented a type of publication known as the monograph—a complete work upon a single theme—and sent numbers of these to the Royal Society of London, who published them and made the author an honorary Fellow. Deciding to embark upon such a study, for example, as the anatomy and life history of the silkworm (*Dissertatio epistolica de bombyce,* London, 1669), Malpighi proceeded to treat the subject exhaustively and methodically, with a well-planned program of work and with patient and careful execution. He had to be highly skillful and original, as no such studies had ever appeared before, and he thus had to work out his own technique as well as details of the subject itself.

Not content with the more superficial and external natural history of his day, Malpighi delved deeply into microscopic structure and incorporated three very modern principles; the comparative method, the elucidation of complex structure in higher animals by working out the simpler condition of the same organ in lower forms, and the physiological basis for interpretation. So, in the monograph on the silkworm, he was the first to show the radically different anatomy of the insect respiratory system, with detailed descriptions and drawings of the spiracles and the breathing tubes or tracheae, that ramify to all parts of the body and thus convey air direct to the tissues, without intervention of either gills or lungs. Most research workers would have let it go at that, but Malpighi went further and dissected the corresponding organs in several other species of insects and described them not only as to structure but with emphasis upon their function. For such reasons he is classed as the first of the moderns, and is the only one of the three early microscopists to be included in a listing of the ten greatest biologists of all time.

His researches embraced significant work on the anatomy of plants, the minute structure of many organs in the vertebrate or human body, and monographs on the development of the chick that stand far above any previous studies of this nature. His name is strewn through modern anatomy. The present-day student encounters the Malpighian tubules of the insect digestive system, the Malpighian layer of the human skin, the Malpighian bodies in the kidney, and the Malpighian corpuscles of the spleen. It was Malpighi who first actually saw the blood capillaries, demonstrating them in the lung of the frog, in which study he also first described the air cells of that organ.

In all of this work he used microscopes extensively, both simple and compound, and in point of time was the first person to turn the lens on life and employ magnifying instruments for planned, systematic researches. The first definite record of his using the microscope is in 1660 (Locy) though doubtless he had done so in studies known to antedate this year. He is hence the "first great microscopist and the founder of minute

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anatomy."

By way of comparison of the three giants of this era, Leeuwenhoek made the largest number of separate observations and contributed a great many valuable discoveries, but did not prosecute organized work along monographic lines; Swammerdam excelled the other two in technique and execution, both of dissections and drawings, but his labors were confined to a narrower range of investigation, mainly insect anatomy; Malpighi undertook exhaustive studies in a greater number of fields and produced a larger number of more important and influential writings. Together, the three men set a new style in scientific studies, marking the beginning of a new era; henceforth the microscope was recognized as an essential instrument in scientific research.

It must not be supposed that even so advanced an investigator as Malpighi was without error; he made his mistakes, both of observation and interpretation, and of omission as well as commission. Among missed opportunities for added fame may be cited his identification of red blood corpuscles as fat globules, so that to Leeuwenhoek went the honor of first correctly describing these highly important bodies, in a comparative study embracing all classes of vertebrates. Malpighi figured and described "utriculi" in his work on plant anatomy, but wrongly designated them as a matrix through which course the vessels. Actually these utriculi were cells, and while he often drew them correctly, he missed their true nature as fundamental building blocks of plant tissues. Further, he supposed that some of the vessels carried air and called them tracheae, likening their function to that of respiratory tubes in insects, and stating that they can expand and contract.

Most famous of his philosophical stands concerns the method of formation of the embryo and grew out of his remarkable studies on the embryology of the chick. He believed that the embryo was preformed in the egg; that is, existed as a fully formed miniature which had only to grow, and thus was founder of the school of Ovists. Leeuwenhoek, discoverer of spermatozoa, on the other hand, held that the next generation was preformed in the sperm, and so originated the opposing group of Spermists. Both of these were warring factions in the then dominant Doctrine of Preformation, an erroneous but highly important philosophy that ruled biological thought in the last half of the seventeenth and first half of the eighteenth centuries. After we have discussed certain minor lights among early microscopists, we shall return to this and certain other controversies of the period.

TRADE NOTES

A revised edition of Professor Alfred Sherwood Romer's excellent *Man and the Vertebrates* is now out, and we are enthusiastic about it. The former work has been completely reset in the very effective modern format of the *New Plan Science Texts,* is larger by four chapters, completely revised, and with many splendid new illustrations. Topics that are new or almost completely so include the frog, endocrine glands, human origins and human races. The material has been organized into "indispensable" and "optional" chapters, allowing the teacher to select those that fit his needs. As text or collateral reading for courses in vertebrate zoology, human biology, evolution, anthropology, and historical geology, this volume will meet with a welcome reception. For the premedical or general student, as well as for the independent worker who wishes background in vertebrate zoology, we can highly recommend this handsome volume.

As can be seen from this and previous reviews, we are not to be numbered among those who regard this series of New Plan Texts in a supercilious manner; on the contrary we are enthusiastic about most of them, since we have used them in our own courses and find that they actually deliver the goods. They attract the student's interest and keep it, and are read with enjoyment, even by the omnipresent trifler whose delight is to boast that "he never cracks a book." The present member of this series has ample meat in it, is well written, beautifully illustrated, and gets across facts in a way to make them remembered. What more can one ask of a text? Pp. ix, 405; many illustrations. University of Chicago Press, 5750 Ellis Ave., Chicago, 1941. $3.50.

Optics and Service Instruments is the title of a small anonymous volume of timely interest. By means of terse explanations and many line diagrams, the nature and behavior of light and the functions of mirrors, prisms and lenses are well explained. Each topic may serve as a guide enabling the reader to perform the many experiments for himself, if he wishes. The telescope and binoculars are then considered, applying the principles previously discussed. While the microscope as such receives scant attention, the volume is nevertheless valuable for the microscopist's library as a text or reference in optics. Pp. 128; figs. 112. Chemical Publishing Co., Inc., 236 King St., Brooklyn, N. Y., 1941. $1.75.

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Well stained slides of the oviduct fluke of poultry, *Prosthogonimus macrorchis,* may be obtained at 90c each or 10 for $7.50 from the Parasitology Supply Co., 3700 40th Ave. S., Minneapolis, Minn. This fluke is described in the well known texts of Hegner, Chandler, and others and being much simpler to study, is preferred by many to the Sheep Liver Fluke, *Fasciola.*

Those living in the vicinity of Newark, N. J., will be interested in a series of meetings at the Newark Museum, Washington Park West, on Microscopy for Beginners, conducted by Rodney B. Miller. The announced topics and dates are: March 5, Equipment of a Microscopist; March 12, How to Examine Specimens; March 19, Practical Uses for Low Power; March 26, Seeing the "Invisible." These occur on Thursday evenings at 8 o'clock, and registration is required, either by mail, telephone, or in person. Registrations will be accepted up to March 5. The series will present a review of the construction of different types of microscopes and accessories, and practice in the handling of material of numerous kinds. The microprojector will be used to display the diversity of structure in living material, both plant and animal.

A.S.A.M. NEWS AND NOTES

The response made by members to *Bulletin 5* was most satisfactory, and everyone seemed to agree that this was the best issue yet. Number 6 is on the fire at present and will be served up shortly.

Meanwhile the Society continues its steady growth, and we are pleased to read in our correspondence that membership and experience in the A.S.A.M. has already resulted in a number of publications by members and the undertaking by them of projects, defense work, fellowships and other manifestations of serious work. One member has written a book, of which details later, and others have been stimulated to enroll in college courses in science. Teachers continue to find that the organization and its publications are most helpful, both personally and in the conduct of science clubs as extra-curricular activities.

It is of the Chapters and their publications, however, that we wish to speak particularly at this time. Probably the best evidence of healthy progress of the Society as a whole is that certain Chapters have now embarked on the ambitious program of getting out their own literature.

First in point of time is the number one Chapter, the Janseen, at Allentown, Pa., from whom we have just received Vol. I, No. 5, of *The Microscopist,* largely the work of Grant Wetherhold, Jr. For the first time this journal makes its appearance with a board cover, printed, and with an excellent halftone cut of a highpowered microscope and chemical accessories. There are 19 pages of mimeographed material, including Chapter news, medical oddities, technique notes on homemade equipment and various procedures, marine life in the laboratory and other articles and miscellaneous notes.

The Indianapolis Chapter issued No. 9 of their *Focus* in December, a hectograph publication of 10 pages. News of Chapter members is especially well done and interesting, and there are rosters, meeting notes, science briefs, editorials, and an illustrated article, "Getting Acquainted With Pollen Grains," by Jane Goodlet.

These groups are doing an excellent piece of work and it is hoped that other Chapters may decide to follow suit before long. It is also suggested that the two specified Chapters mail copies of their publications to the secretaries of each of the other organizations within the Society.

Enlistments of many members in all branches of the service continue, but in every case membership and interest in the Society is retained, though most usually work with the microscope has to be suspended for the duration.